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I. INTRODUCTION

This report is devoted to reviewing the historical and contemporary literature on the relationship between technological, farm structural, and rural community change in the Northeast Region with the goal of increasing our understanding of how emergent agricultural technologies will affect farm structure and rural communities over the next two decades. In addition to reviewing the available literature on the interrelations among technology, farm structure, and rural communities, the authors will present the results of an empirical study conducted for the purpose of this report. We will also advance some tentative ideas about likely scenarios for farm structural change in the year 2000 for the Northeast and, for each scenario, will discuss the public policies necessary to bring it about and its likely consequences for rural communities in the Northeast.

A. Definition of a Rural-Agricultural Community

For purposes of this report, rural communities are defined as places with less than 20,000 inhabitants in a nonmetropolitan county (see Hines et al., 1975, and Brown and Beale, 1981, for discussions of the distinction between metro and nonmetro counties). Particular emphasis will be given to nonmetropolitan counties in which agriculture accounts for a relatively large ($\geq$5 percent) proportion of labor-proprietor income. The Northeast Region includes six New England and three Middle Atlantic states, as described below.

B. Plan of the Study

The initial portion of the report will be devoted to surveying the major research literature on farm structure and rural communities in the Northeast for the period from 1970 to the present. We emphasize the post-1970 period for three major reasons. First, the years from 1970 to 1980 represent the most recent decade-long period for which change in agricultural technology, farm structure, and rural community conditions can be examined empirically. Second, the Northeast (and the U.S. as a whole) post-1970 witnessed a new pattern of farm structural change in the 1970s; whereas the farm population and the number of farms in the Region generally were in continuous decline from 1900-1970, the period from 1970 to the present has generally been one of stabilization of farm numbers and, in several states in the Northeast, has involved small increases in the number of farms. Third, the Northeast and the U.S. as a whole exprienced a new pattern of rural-urban population growth during the 1970s such that its nonmetropolitan counties grew faster than its metropolitcan counties.

Among the most important points to be emphasized below are that agriculture tends to be a smaller component of the Northeast economy than is the case in other regions such as the Corn Belt and Great Plains and that the Northeast has for several decades had a relatively privileged nonmetropolitan/rural population. These characteristics of the Northeast agricultural economy and its rural communities have long historical roots, which are traced in some detail in Appendix A.

We then examine preliminary results from an empirical study of technological, farm structural, and rural community change in the Northeast, utilizing census-type data for all nonmetropolitan counties in the Region

during the period from 1969/1970 to 1978/1980. These results are used to estimate the recent impacts of change in technological and farm structure on the viability of rural communities in the Northeast. These data also provide the basis for estimates of the number of rural communities in the region that might be significantly affected by emerging agricultural technologies over the next 15 to 20 years.

The final sections deal with projections of changes in technology and farm structure that have been calculated by consultants to the Office of Technology Assessment, U.S. Congress. Based on these projections, we identify the types of public policies necessary to result in three scenarios of farm structure in the Northeast: (1) reproduction of the current (according to the 1982 Census of Agriculture) farm structure, (2) a significantly more "dualistic" farm structure (i.e., with substantially higher proportions of both larger-than-family and small, part-time farms, on one hand, and a smaller proportion of medium-sized family farms, on the other), and (3) an increased number of moderate-sized farms (at the expense of large-scale farms). We then speculate on which scenario will be the most likely for the Northeast and the reasons for this assessment. Finally, given this assessment of the direction of technological and farm structural change in the Northeast, and their likely impacts on rural communities, we suggest public policies that will assist Northeast rural communities and nonmetropolitan residents in adapting to these changes.

C. The Northeast Region

For purposes of this report, the Northeast Region includes the states of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. This delineation of the region is coterminous with that used for reporting of Census of Agriculture data. To a large extent the data presented in this report will be for the Northeast region as defined above. We will, however, present some data that pertain to the Northeast-Great Lakes region utilized for purposes of reporting Census of Population data (see Hines et al., 1975; Brown and Beale, 1981). The Northeast-Great Lakes region includes the nine states noted above, plus Maryland, Delaware, Ohio, Michigan, and parts of Indiana, Illinois, Wisconsin, and Minnesota. Finally, we will at times utilize Census of Agriculture and Census of Population data of a subregional nature--primarily data for the state of New York, which because of the presence of Cornell University has received more intensive and sustained research attention than have the other states in the region.

The Northeast Region has a certain coherence as a region, principally on the basis of its agricultural economy. Relative to the rest of the U.S., the nine Northeastern states are characterized by farm structures that involve little industrial-type farming, small average farm sizes, a pattern of specialization of commodity production in which products tend to be destined for markets in major urban centers in the region (rather than for interregional or international markets), and a longstanding pattern of loss of land in farms (which was, however, attenuated beginning in the early 1970s). Also, the farm population as a percentage of the rural (or, in terms of the more recent measure, the nonmetropolitan) population in the Northeast has, since the turn of the century, been lower than that of the other agricultural regions of the U.S.

Despite the broad similarities among the states and substate areas in the larger Northeast region, the region is nonetheless quite diverse. There are two major sources of diversity relevant to this report. One source of diversity is agroecological in nature. The six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) generally have low quality soils and short growing seasons, albeit with certain exceptions such as the Connecticut River Valley. The three Middle Atlantic states (New Jersey, New York and Pennsylvania) generally have more favorable agricultural conditions. The second source of diversity is socioeconomic in nature and relates to the dramatic variations in urban-metropolitan influence in the region. The contrasts are striking between the Boston to Washington, D.C. megalopolis and its densely-settled 35 or so million inhabitants on one hand, and the highly rural state of Vermont, which has no Standard Metropolitan Statistical Area (SMSA), on the other.

It was noted earlier that a substantial amount of the empirical evidence reported below will be from New York State. A rationale other than sheer availability of data for justifying this emphasis on New York State is that this state reflects the range of agroecological and socioeconomic diversity discussed above. Northern New York, often referred to as the "North Country," is similar to the highly rural, agroecologically-less-favored states of Northern New England; West and Central New York (the Erie Canal Belt, and the Southern and Western Tiers) represents the more favorable agroecological zones of the Middle Atlantic region; and Southeastern New York (the Hudson River Valley) is characterized by the "interstitial rural areas" (Beale, 1981:54-5) of the larger Northeastern metro belt.

II. INTERRELATIONS BETWEEN FARM STRUCTURE AND RURAL COMMUNITY WELL-BEING IN THE NORTHEAST, 1970 TO THE PRESENT

A. Recent Farm Structure Changes in the Northeast

Virtually all analyses of farm structural change in the Northeast during the first seven decades of the twentieth century have emphasized that declines in farm numbers and in the size of the farm population accelerated after World War II and that these declines were most pronounced among small farm households (see, for example, Schertz, 1979; Stanton and Plimpton, 1979; and Appendix A below). But it is now widely recognized that there emerged a distinctly new pattern of farm structural change in the Northeast and the U.S. during the 1970s; the trend of farm structural change in the 1970s was toward "dualism," in which there were increases in the relative numbers of both very large and very small farms, along with a "disappearing middle" of medium-sized, full-time family farms (Tweeten and Huffman, 1980; Buttel, 1983b, 1984). Concomitant with the 1970s trend away from rapid loss of smaller farms was the stabilization of farm numbers.

Table 1 reports data on numbers of farms by selected characteristics for the Northeast Regional and the U.S. for 1974 and 1982. These data show that the Northeast generally followed the larger U. S. trend toward a more dualistic farm structure during this period of time. For both the Northeast and the U.S., farm numbers and the average size of farms were relatively unchanged over the eight-year period. The Northeast exhibited a 3.5 percent increase in the number of farms from 1974 to 1982, along with a 4.4

percent decrease in the average size of farm, indicating that the bulk of the gain in farms was concentrated among the smallest farm sizes. U.S. farms decreased by 0.3 percent during the period.

The data in Table 1 on farm numbers by size of farms in acres underscore the dualistic trajectory of structural change in both the Northeast and U.S.; farms with less than 50 acres exhibited significant increases, farms from 50 to 499 acres declined, and farms with 1,000 or more acres increased in numbers. The Northeast Region differed from national trends only in its substantial growth in farms with 500 to 999 acres, a 10.1 percent increase, compared to a 1.6 percent decrease for the U.S., and in its more rapid increases in the numbers of farms with 1,000 or more acres than was the case for the U.S. as a whole.

The data in Table 1 suggest, on balance, that there has been a stabilization of the position of Northeast agriculture in the U.S. agricultural structure during the 1970s and early 1980s. The value of agricultural products sold in the Northeast increased more rapidly from 1974 to 1982 (67.3 percent) than was the case in the U.S. (61.6 percent), although average sales per farm grew somewhat more slowly in the Northeast than in the U.S. (61.6 and 66.9 percent, respectively). The value of land and buildings, measured either on a per farm or per acre basis, increased somewhat more slowly in the Northeast than in the U.S. The average value of land and buildings per acre in the Northeast, however, remained substantially above the U.S. average in 1982 ($1,236 and $791, respectively). Increases in the overall inventory of machinery and equipment and in the value of machinery and equipment per farm in the Northeast lagged slightly behind the U.S. averages. Finally, the Northeast continued its long trend toward decline in land in farms (a 1.3 percent decrease from 1974 to 1982, compared to the U.S. figure of -0.3 percent) and exhibited a slower rate of increase in total cropland during the 1974 to 1982 period than did the U.S. (0.8 and 1.2 percent, respectively).

The farm structure of the Northeast during the 1970s and early 1980s showed increased strength in its small-farm, part-time farming component. The number of farm operators whose principal occupation was nonfarming, who worked any days off the farm, and who worked 100 or more days off the farm increased more rapidly in the Northeast than in the U.S. The Northeast also exhibited a larger increase in the number of individual or family farms than did the U.S., which, given the fact that small, part-time farms tend to be family- or individual-type farms (Buttel, 1982b; Buttel and Gertler, 1982), underscores the growing importance of the small-scale, part-time farming sector in Northeast agriculture.

It was noted earlier that the Northeast registered larger increases in the number of farms with 1,000 or more acres than did the U.S. as a whole. This relatively rapid growth of farms with large acreages apparently did not, however, tend to take the form of industrial-type, capital-intensive farming. The dollar value of hired labor increased less rapidly in the Northeast than it did for the U.S. as a whole (77.3 and 81.3 percent, respectively), as was the case for the number of farms with hired workers working 150 or more days per year (see Table 1). The rate of increase in the use of chemical fertilizers and other agricultural chemicals in the Northeast was also lower than for the U.S. Also, as noted earlier, the

TABLE 1. Numbers of Farms By Selected Characteristics 1974 and 1982, and Percent Change, 1974-82, Nine Northeastern States and U.S.

Farm Structure Characteristics	Northeast Region 1974	Northeast Region 1982	Percent Change, 1974-82	U.S. 1974	U.S. 1982	Percent Change, 1974-82
Number of Farms	127,531	131,991	3.5	2,314,013	2,241,124	-0.3
Land in Farms (acres)	23,359,889	23,061,163	-1.3	1,017,030,357	984,755,115	-0.3
Aver. Size of Farm	183	175	-4.4	440	439	-0.1
Value of Land & Bldgs.						
Average per Farm	121,227	214,623	77.0	147,838	347,974	135.2
Average per Acre	662	1,236	86.7	336	791	135.4
Farms by Size						
Less than 10 Acres	7,689	10,599	37.8	128,254	187,699	46.3
10-49 Acres	19,416	26,421	36.1	379,543	449,301	18.3
50-179 Acres	54,901	51,866	-5.5	827,884	711,701	-14.0
180-499 Acres	37,864	34,533	-8.8	616,098	526,566	-14.5
500-999 Acres	6,421	7,070	10.1	207,297	203,936	-1.6
1,000-1,999 Acres	1,046	1,282	22.5	92,712	97,396	5.1
≥2,000 Acres	194	220	13.4	62,225	64,525	3.7
Land Use						
Total Cropland	13,851,473	13,972,802	0.8	440,039,087	445,527,557	1.2
Woodland	5,809,958	5,899,750	1.5	92,527,627	87,133,026	-5.8
Agricultural Products Sold						
Market Value ($1,000)	4,291,380	7,179,543	67.3	81,526,124	131,810,903	61.6
Average per Farm	33,650	54,394	61.6	35,231	58,815	66.9
Crops	1,440,397	2,181,303	51.4	41,790,360	62,274,394	49.0
Livestock	2,216,436	4,998,240	125.5	33,301,560	69,536,509	108.8
Poultry	616,094	844,395	37.1	6,202,291	9,732,222	56.9
Farms by Type of Organization						
Individual or Family	82,142**	115,713	40.9	1,517,573**	1,945,724	28.2
Corporation	2,615**	4,098	56.7	28,656**	59,788	108.6
Tenure of Operator						
Full Owner	83,389	82,043	-1.6	1,423,953	1,325,931	-6.9
Part Owner	36,112	40,005	10.8	628,224	656,219	4.5
Tenant	8,030	9,943	23.8	261,836	258,974	-1.1
Principal Occupation						
Farming	78,144	75,111	-3.8	1,427,368	1,234,858	-13.4
Nonfarming	46,390	56,442	21.5	851,902	1,006,266	18.1
Operators Reporting Any Days of Work Off Farm						
Any	56,670	67,751	19.6	1,011,476	1,187,490	17.4
≥100 Days	46,691	56,048	20.0	814,555	963,728	18.3

Continued

TABLE 1 (continued)

Farm Structure Characteristics	Northeast Region 1974	Northeast Region 1982	Percent Change, 1974-82	U.S. 1974	U.S. 1982	Percent Change, 1974-82
Selected Production Expenses ($1,000)						
Commercial Fertilizer	207,433	309,769	49.3	5,137,361	7,689,577	49.7
Other Agric. Chemicals	74,225	140,301	89.0	1,757,776	4,282,795	143.6
Hired Labor	401,846	712,383	77.3	4,652,074	8,434,399	81.3
Workers Working ≥150 Days:Farms	21,775**	29,242	34.3	223,093**	312,621	40.1
Numbers of Workers*	66,149	88,547	33.9	712,715**	950,112	33.3
Machinery and Equipment						
Estimated Value($1,000)	2,879,414	5,337,081	85.4	48,402,626	93,686,308	93.6
Average per Farm	23,470	40,435	72.3	22,303	41,930	88.0

*Computed from the preliminary reports for the nine Northeast states.
**Among farms with sales ≥$2,500.

SOURCES: 1974 data: **1978 Census of Agriculture: Preliminary Report** (Northeast Region and United States) (Washington, D.C.., Bureau of the Census, U.S. Department of Commerce, 1980); 1982 data: **1982 Census of Agriculture: Preliminary Report** (nine Northeastern states and United States) (Washington, D.C.: Bureau of the Census, U.S. Department of Commerce, 1983).

value of the Northeast's machinery and equipment inventory increased less rapidly than did that of the U.S. Finally, while the Northeast exhibited a 56.7 percent increase in the number of corporation farms, this increase was substantially lower than the 108.6 percent increase for the U.S.

As noted in Appendix A, the Northeast has long had a low rate of tenancy. During the 1974 to 1982 period, however, the number of tenant farms in the Northeast increased considerably (23.8 percent, versus the U.S. average of -1.1 percent). This may be the case because many of the persons entering agriculture in the Northeast as small farm operators did so on rented land. Nevertheless, the proportion of tenants in Northeast agriculture remains substantially lower than the U.S. average (7.5 and 11.6 percent, respectively; see Table 2).

Table 2 reports comparable farm structure data for the Northeast and the U.S. for 1982; however, instead of reporting the numbers of farms and percent changes by selected characteristics for 1974 and 1982, Table 2 shows percent distributions and other standardized measures of farm structure for the Northeast and U.S. for the most recent (1982) Census of Agriculture. The dominant feature of Table 2 is the similarity between the farm structure of the Northeast and that of the U.S. Although Northeast farms tend to be considerably smaller than U.S. farms in average acreage and average value of land and buildings, average gross sales per farm in the Northeast and the U.S. and distributions of farms by value of gross sales are quite similar. Likewise there is considerable similarity in the distributions of farms by type of organization, tenure of operator, principal occupation of the farm operator, and prevalence of off-farm employment. It should be noted, however, that these gross indicators of farm structure may conceal important differences; for example, legally incorporated farms in the Northeast average only about 400 acres per farm, whereas legally incorporated farms in the U.S. (both family and nonfamily) average approximately 2,000 acres each. Thus, legal incorporation of farms has a substantially different character in the Northeast than in much of the rest of the U.S., where many corporation farms are industrial-type farms that are characterized by absentee ownership, hired management, and hired labor (Rodefeld, 1980).

Table 2 indicates that farms in the Northeast, while typically small in acreage relative to national standards, tend to be farmed relatively intensively. Northeast farmers tend to use higher levels of commercial fertilizers and other agricultural chemicals per acre than do U.S. farmers. Northeast farmers in 1982 derived 44.0 percent of their gross farm sales from sales of dairy products, a relatively labor- and capital-intensive commodity (Forste and Frick, 1979), compared to 12.4 percent for U.S. farmers as a whole. While U.S. farmers derived a larger proportion of their gross sales from crops than did those in the Northeast in 1982, Northeast farmers tended to devote a high proportion of their cropland to labor- and capital-intensive fruit and vegetable commodities (Schertz, 1979). Finally, despite the relatively low prevalence of industrial-type farming in the Northeast (as gauged by low proportions of corporation farms and of farms with high levels of gross sales and large acreages), the Northeast region is characterized by a high level of use of hired labor. Table 7 shows that in 1982, hired labor expenses as a percent of agricultural products sold were higher in the Northeast than in the U.S., and a

TABLE 2. Farm Structure Indicators: Northeast Region and United States, 1982

Farm Structure Indicators	Northeast	U.S.
Average Size of Farm (Acres)	175	439
Average Value of Land and Buildings per Farm	$214,623	$347,974
Average Value of Land and Buildings per Acre	1,236	791
Percent Distribution of Farms by Acreage		
<10	8.0%	8.4%
10-49	20.0	20.0
50-179	39.3	31.8
180-499	26.2	23.5
500-999	5.4	9.1
1,000-1,999	1.0	4.3
≥2,000	0.2	2.9
Percent Distribution of Farms by Type of Organization		
Individual or Family	87.7%	86.8%
Corporation		
Family-held	2.7	2.3
Other Than Family Held	0.4	0.3
Percent Distribution of Farms by Tenure of Operator		
Full Owner	62.2%	59.2%
Part Owner	30.3	29.3
Tenant	7.5	11.6
Percent Distribution of Farms by Principal Occupation of Operator		
Farming	56.9%	55.1%
Nonfarming	42.8	44.9
Percent of Farm Operators Reporting Any Days of Work Off Farm	51.3%	53.0%
Percent of Farm Operators Reporting ≥10 Days of Work Off Farm	42.5%	43.0%

Continued

TABLE 2 (continued)

Farm Structure Indicators	Northeast	U.S.
Average Market Value of Agricultural Products Sold per Farm ($)	$54,394	$58,815
Percent Distribution of Farms by Value of Sales		
≥$250,000	3.6%	3.9%
$100,000-249,999	11.2	9.6
$40,00-99,999	16.9	14.9
$20,000-39,999	8.9	11.1
$10,000-19,999	9.1	11.6
$5,000-9,999	11.2	12.6
<$5,000	39.1	36.4
$ Commercial Fertilizer/Acre of Cropland	$22.2	$17.25
$ Other Agricultural Chemicals/Acre of Cropland	$10.0	$9.6
$ Hired Labor as Percent of Cultural Products Sold	9.9%	6.4%
Percent of Farms With Workers Working ≥150 Days	22.2	13.9
Workers/Farm	3.03	3.04
Estimated Value of Machinery and Equipment/Farm	$40,435	$41,930
Sales of Crops as Percent of Market Value of Agricultural Products Sold	30.4%	47.2%
Sales of Livestock as Percent of Market Value of Agricultural Products Sold	69.6	52.8
Sales of Dairy Products as Percent of Market Value of Agricultural Products Sold	44.0	12.4
Sales of Poultry as Percent of Market Value of Agricultural Products Sold	11.8	7.4

substantially larger proportion of Northeast farmers hired full-time agricultural labor (150 or more days of work) than did U.S. farmers (22.2 and 13.9 percent, respectively).

The pattern that emerges from these data on farm structure in the Northeast and the U.S. is that the Northeast region has achieved parity with the rest of U.S. agriculture--and, accordingly, a comparable pattern of farm structure--and has done so by continuing and deepening its long-standing pattern of specialization in dairy products, poultry, and fruits and vegetables. The position of Northeast agriculture in the U.S. agricultural structure has become stabilized now that thousands of marginal acres have been shifted out of agricultural production. This is not to say that the farm structures in the Northeast and the U.S. are identical; the Northeast has somewhat larger proportions of very small, "subfamily" farms, lower levels of large-scale industrial farming, and a greater prevalence of medium-sized farms (i.e., with sales of $40,000-99,999) than does the U.S. Nevertheless, farm structure in the Northeast appears to have converged with that of the nation over the past several decades; moreover, the Northeast and the rest of the U.S. exhibited comparable trends in the 1970s and early 1980s toward a more dualistic pattern of farm structure.

B. Farm and Nonfarm Factors Affecting the Structure of Agriculture and Rural Community Well-Being in the Northeast

Schertz (1979) in his chapter on "The Northeast" in **Another Revolution in U.S. Farming** (Schertz and others, 1979) identified several forces--most of them nonfarm in nature--that have affected recent structural change in Northeast agriculture. Among the factors mentioned by Schertz were: (1) urbanization and industrialization in the Region, (2) nonfarm employment opportunities, (3) dairy commodity programs, (4) the character of the Region's natural resources, and (5) changes in the costs of transporting farm inputs and products.

In 1977, 12.9 percent of the land in the Northeast Region was devoted to "urban" uses (including transportation), which was significantly higher than the U.S. average of 5.7 percent (Schertz, 1979:270). One-third of the Region's acres in urban uses in 1977 was so converted in the previous 10 years. Schertz argues that the growing urbanization of the Northeast Region has resulted in urban pressure on farmland prices and in farmland values and taxation burdens that are often high relative to the ability of the lands to generate income streams in farm production. He suggests that further urban-induced inflation in farmland values in the Northeast may result in loss of land in farms and in further decline in the position of agriculture in the Northeast. Schertz, however, notes that while urban pressures may adversely affect aggregate agricultural production in the Northeast in the future, urbanization does present greater opportunities to Northeast farmers to pursue off-farm employment. This is particularly the case because of the industrial deconcentration--the movement of industrial jobs from large cities to small cities and rural areas--that has occurred in the Northeast Region for over two decades (Hastings and White, 1984; Young, 1984). Part-time farming made possible by expanded nonfarm employment opportunities in rural areas has historically enabled the Northeast to retain agricultural resources in small production units, rather than having these resources be consolidated into larger farming businesses (Schertz,

1979:271). The high concentration of large urban centers also enabled the Region's fruit, vegetable, nursery, and poultry producers to take advantage of large local product markets.

It was noted earlier that dairy production is the single most important commodity sector in the Northeast, representing 44.0 percent of gross farm sales in 1982, and accordingly the nature of federal and state dairy commodity programs has played a major role in shaping farm structure in the Northeast. The essence of dairy commodity programs has been for the federal government to purchase dairy products (such as cheese and butter), when necessary, to allow milk prices to reach the mandated support level. Federal and state milk marketing orders and pooling procedures have had the following impacts: (1) the price of fluid milk has been set higher than for milk used to produce butter and cheese, (2) producers receive a "pool" price reflecting the combination of fluid and "manufactured" milk, and (3) the pool price does not vary by the farmer's volume of milk sales (Forste and Frick, 1979:143). The Northeast has generally benefitted from the provisions of these federal and state dairy programs. These commodity programs have increased the overall profitability and the level of milk production in all regions, but this has been of particular benefit to the Northeast because of the suitability of its agricultural resources for dairying and the longstanding specialization of the Northeast Region in dairy production. The Northeast has also benefitted from provisions of the dairy commodity programs that have insulated its producers from competition with dairy farmers in the North Central Region and that have equalized milk prices for producers of varying quantities of milk. Schertz (1979:272) argues that "[t]hese price effects, in combination with government support of dairy prices, have encouraged more milk production, led to higher farm incomes, and slowed the decline of farm numbers in the Northeast." Schertz notes as well that changes in dairy commodity programs that would eliminate government pricing and pooling policies would reduce milk production, farm incomes, and farm numbers in the Northeast Region, as would a significant reduction of the federal price support purchases. Similar impacts on Northeast dairy producers would result from eliminating current restrictions on cheese and butter imports and ending the prohibition of sales of reconstituted milk at lower prices than for fresh milk.

The character of the Northeast's farmland resources has long affected the structure of agriculture in the Region. While there are areas in the Region where there are high-quality soils over large tracts suitable for large-scale mechanization, the bulk of the Region consists of low- or variable-quality soils with rough topography. These latter soils are a barrier to mechanization and consolidation of farmland into large units. Schertz (1979:273-4) notes that the Northeast in 1977 had only 35 million acres of land suitable for regular cultivation (land capability classes I, II, and III), representing 37 percent of the total nonfederal rural land in the Region. By comparison, 44 percent of total nonfederal rural land in the U.S. is suitable for regular cultivation, with the percentage being 64 percent in the North Central Region, the Northeast's major competitor. The nature of the Northeast's farmland resources, plus the wide availability of the part-time farming option for the Region's small ("subfamily") and medium-sized family farmers, makes it unlikely that the Region will experience rapid consolidation of farmland into industrial-scale farming units such as the 10,000-cow dairies now prevalent throughout much of the Sunbelt.

A final factor that has affected and will continue to affect agriculture in the Northeast is transportation costs. The Northeast states contain nearly one-quarter of the U.S. population but only 3 percent of its farmland. The Region is thus a major food importer. The importation of food into the Region via rail and truck transportation is obviously essential to the Northeast's food system, but low-cost interregional transportation subjects Northeast farmers to competition from other states. Because of the Region's generally low- and variable-quality soil resources, crop production per acre in the Northeast has lagged behind the U.S. average for over two decades, and the Region's aggregate farm productivity has been lower than the national average since the mid-1970s (Schertz, 1979:267-8). Thus, the Region's farmers are generally vulnerable to interregional competition. The cheap energy prices that prevailed until the early 1970s contributed to declining transportation costs and to the decline of the Northeast's share of farm cash receipts. If, as many energy analysts suggest, energy prices increase substantially over the next one to two decades, the costs of interregional transportation will rise, and there will accordingly be increased opportunities for Northeast farmers to produce many vegetable, fruit, and nursery products that are presently imported into the Region (How, 1980).

C. Social Forces Affecting Rural Communities in the Northeast: The Case of New York State

To our knowledge there have been no quantitative empirical studies, such as that of Swanson (1982) for Pennsylvania places from 1930-60, of the relationships between farm structure and rural community characteristics in the Northeast pertaining to the post-1970 period. Neither has there been a continuation of the rural community studies of the sort done by Brunner and associates (1927, 1933, 1937) into the 1970s and 1980s. There is a certain irony in the fact that as our ability to generate and analyze social data has grown, we now know less about the relationships between farm and community structures than we did 50 years ago (Larson, 1981). Lacking current information in this area, we will proceed in two ways. First, we will review some available data on trends in the changing characteristics of the nonmetropolitan population in one Northeast state, New York State. The present section is devoted to this task. Second, in the succeeding section of the report we will present selected data from an empirical study of nonmetropolitan counties in the Northeast conducted by the authors.

The major source of data for this section of the report comes from a study by Eberts (1984) on **Socioeconomic Trends in Rural New York State** prepared for the New York State Legislative Commission on Rural Resources. Eberts' study reports data for New York counties grouped into six categories--two categories of metropolitan counties and four categories of nonmetropolitan counties. The two categories of metropolitan counties consist of "downstate" (New York City-area) and "upstate" metro counties. (The criterion for distinguishing between these two types of metro counties was whether the county had less than 10 percent or 10 percent or more of its population living in "nonurban" places [with less than 2,500 residents]. The downstate metro counties all had less than 10 percent of their population in nonurban places, while the upstate metro counties all had more than 10 percent of their populations living in these smaller places.)

Eberts' typology of nonmetro counties was based on two dichotomous factors: (1) percentage of the county work force commuting outside the county of residence for employment (less than 20 percent and 20 percent or greater), and (2) size of the largest place in the county (less than 10,000 and 10,000 or more). These two dichotomous factors yielded four nonmetro county types, as described in Table 3 (Eberts, 1984:11). The four nonmetro (or "rural") county types were counties with: (1) extensive urban influence, (2) considerable urban influence, (3) moderate urban influence, and (4) limited urban influence. The section of Eberts' study of greatest relevance for our purposes was that devoted to reporting aggregate or weighted data on a number of socioeconomic characteristics for the two types of metropolitan counties and the four categories of rural counties, with our principal focus being on the rural counties.

Table 4 provides data on the aggregate populations of the four county types in New York State from 1950 to 1980. These data show, as has the work of Brown and Beale (1981) on population change in the Northeast, that rural counties in New York State generally did not experience the population declines in the 1950s and 1960s that were prevalent in many rural counties in the North Central and Great Plains regions. Table 4 indicates that for each of the four types of rural counties in New York State there was continuous, albeit uneven, population growth from 1950-1980. It is useful to note as well that the most highly rural counties in New York State (types 5 and 6--counties under moderate and limited urban influence, respectively) tended, like many other rural counties in the U.S. during the 1970s, to experience substantial population growth during the decade of the 1970s.

Tables 5 and 6 give data on the proportions of the work forces of the six county types employed in, respectively, the service and manufacturing sectors. These data indicate that in the 1970s there were surprisingly few differences in the sectoral labor force profiles of New York's metro and rural counties. For 30 years there have been relatively small differences among the six county types in service and manufacturing employment. The only exception has been counties under limited urban influence, which, until 1970, tended to have fewer workers in the manufacturing sector than the upstate metro and the other nonmetro county types. By 1980, however, the proportion of the labor force in manufacturing in the counties with limited urban influence had largely converged with that of the other county types, and, in fact, these seven most highly rural counties were the only county categories to exhibit a rise in the proportion of the labor force in manufacturing from 1970 to 1980. Table 7 provides further evidence on this point; the rural counties with limited urban influence were the only county type to experience an increase in the number of manufacturing units employing 100 or more persons during the 1970-80 period.

Table 8 provides data on the proportions of the labor forces of the six county types that are engaged in primary sector employment (which principally involves agricultural employment). As would be expected, the degree of urban influence on rural counties is inversely associated with the level of primary sector employment. The seven rural counties with limited urban influence had 7.1 percent of their collective work forces engaged in primary sector employment in 1980, while the rural county types with moderate, considerable, and extensive urban influence had,

Table 3. A Typology of New York State Rural Counties Based on Extent of Urban Influence.*

Percentage of Work Force Which Commutes Outside County of Residence for Employment	Size of Largest Place in County (10,000 or More Persons): Higher than 10,000	Size of Largest Place in County (10,000 or More Persons): Lower than 10,000	
Higher (20% or more)	3. Extensive Urban Influence Cayuga, Ontario, Fulton, Oswego, Genesee, Rensselaer, Madison, Saratoga, Montgomery, Schenectady, Wayne (N = 11)	5. Moderate Urban Influence Columbia, Schoharie, Greene, Schuyler, Hamilton, Seneca, Herkimer, Tioga, Livingston, Washington, Orleans, Wyoming, Putnam, Yates (N = 14)	(N = 25)
Lower (19.9% or less)	4. Considerable Urban Influence Cattaraugus, Otsego, Chautauqua, St. Lawrence, Chemung, Steuben, Clinton, Tompkins, Cortland, Ulster, Jefferson, Warren (N = 12)	6. Limited Urban Influence Allegany, Essex, Chenango, Franklin, Delaware, Lewis, Sullivan (N = 7)	(N = 19)
	(N = 23)	(N = 21)	Total N = 44

*Urban influence is defined here as a function of size of largest municipality in a county and the percentage of the county's work force which commutes outside the county for employment.

SOURCE: Eberts (1984:11).

Table 4. Population Size in County Types 1-6, New York State, 1950-1980*

County Type	1950	1960	1970	1980
Metropolitan				
1	9,555,943	10,694,633	11,575,740	10,803,581
2	2,854,556	3,426,102	3,759,542	3,666,665
Rural				
3	819,198	897,869	1,002,047	1,056,098
4	908,265	1,015,782	1,073,587	1,120,642
5	421,720	468,594	538,145	591,881
6	270,510	279,324	292,330	319,205

*SOURCE: Eberts (1984). For tables 10-22, taken from Eberts (1984:122-36), metropolitan county types 1 and 2 are, respectively, the downstate and upstate metro county types (see the definitions in the text), while the rural county types 3 through six are, respectively, the rural counties with extensive, considerable, moderate, and limited urban influence (see Table 9 and the text).

Table 5. Tertiary (Service) Sector Employment as a Percentage of Work Force in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	72.3	73.7	80.6	82.0
2	59.0	62.1	68.1	71.9
Rural				
3	52.0	58.2	66.1	70.0
4	56.9	61.0	68.4	70.4
5	51.8	57.0	63.2	66.5
6	57.4	62.6	70.2	71.2

Table 6. Secondary Sector Employment as a Percentage of Work Force in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	27.2	25.8	19.0	17.5
2	37.8	36.0	30.6	27.0
Rural				
3	38.9	35.6	30.3	26.9
4	29.4	30.7	26.3	25.0
5	29.3	31.6	29.9	27.5
6	18.8	21.5	20.8	21.7

Table 7. Total Number of Manufacturing Units Employing 100 or More Persons in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	1,526	1,815	1,744	1,475
2	727	661	601	589
Rural				
3	185	198	180	164
4	204	193	204	202
5	94	93	95	85
6	33	34	38	46

Table 8. Primary Sector Employment as a Percentage of Work Force in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	0.6	0.5	0.4	0.5
2	3.2	1.9	1.3	1.1
Rural				
3	9.1	6.1	3.5	3.1
4	13.7	8.4	5.3	4.6
5	18.8	11.4	6.9	6.0
6	23.8	15.9	9.0	7.1

respectively, 6.0, 4.6, and 3.1 percent of their work forces in the primary sector in that year.

The data in Table 9 indicate, however, that the importance of the primary (agricultural) sector in a county economy is not positively correlated with the percentage of county land in agriculture. In fact, the rural counties with the highest proportion of primary sector employment appear to be those with the smallest proportion of land in agriculture. For example, the rural counties with limited urban influence in 1980 had a far smaller proportion of their land in agriculture (22.7 percent) than did even the upstate metro counties (32.4). Another way of putting the matter is that many of the most important agricultural counties in New York State--those which, on the basis of proportion of land in agriculture, one can infer have the highest quality agricultural lands--are relatively urbanized counties, while the more highly rural counties tend to have lower quality agricultural resources.

Table 10, which reports the number of farms by county types, suggests further that farms in New York State are by no means located largely in remote rural counties, but instead are widely distributed across the six county types (with the exception of the downstate metro counties which have relatively few farms). More specifically, over 16,000 of New York's roughly 43,000 farms in 1980 were located in the upstate metro counties or in the rural counties under extensive urban influence. The seven counties with limited urban influence contained only 5,267 of New York's farms in 1980. These observations are also manifest in Tables 11 and 12, which report, respectively, total cropland acres harvested and total market value of agricultural products sold by county type. It can be seen from Table 11 that a significant number of acres of New York's harvested cropland are located in either metropolitan counties or in rural counties under extensive urban influence. Table 12 shows further that relatively urbanized counties account for a major share of the State's total agricultural production.

Tables 13-16 give data on selected socioeconomic characteristics by county type. Table 13 reports median family income (adjusted to 1980 dollars by the Consumer Price Index) and shows that there has been only moderate variation in family income by county type for several decades. The counties with limited urban influence have long had the lowest level of median family income, and it would appear that the income position of these counties has declined slightly relative to the other rural county types over the past decade. Nevertheless, there are no dramatic income disparities across New York State counties, even though income levels in rural counties have long lagged somewhat behind those of metropolitan counties.

A similar pattern is revealed in Table 14, which gives percentages of adult populations that have completed some or more college by county type. The educational levels of the downstate metropolitan counties have generally been higher than those of the rural counties in the post-World War II period. The magnitude of these disparities has, however, continued to be relatively small in 1980. Somewhat different patterns are revealed in Tables 15 and 16, which report data on, respectively, percentages of the labor force unemployed and of families in poverty by county type from 1950 to 1980. Table 15 shows that there has been a longstanding metropolitan/rural county differentials in unemployment rates, with rural counties,

Table 9. Average Percentage of Land in Agriculture in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	15.9	9.5	6.1	4.6
2	60.3	48.6	35.6	32.4
Rural				
3	58.6	54.7	42.3	40.3
4	57.2	48.2	36.3	33.8
5	50.9	44.1	35.1	33.7
6	41.2	35.1	25.1	22.7

Table 10. Total Number of Farms in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	4,185	2,043	1,030	1,116
2	26,919	16,807	10,350	8,198
Rural				
3	23,415	16,076	10,111	8,098
4	34,199	23,049	14,479	12,242
5	20,920	14,159	9,560	8,154
6	15,339	10,240	6,379	5,267

Table 11. Total Acres Harvested in Agriculture in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	21,714	13,017	8,302	6,293
2	276,542	222,958	163,481	148,814
Rural				
3	250,240	233,641	180,877	172,207
4	488,099	411,663	309,643	288,491
5	297,558	257,975	205,265	196,881
6	242,835	207,069	147,641	133,564

Table 12. Total Market Value of Agricultural Products Sold (Thousands of Dollars Adjusted to 1980 Dollars) in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	213,278	176,965	162,013	114,282
2	514,653	491,929	478,297	438,353
Rural				
3	413,167	448,578	444,486	447,462
4	563,705	584,201	622,148	606,962
5	660,799	508,918	484,246	482,364
6	300,023	283,560	331,788	292,352

Table 13. Median Family Income Adjusted to 1980 Dollars by the Consumer Price Index in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	12,610	18,525	24,527	23,192
2	12,096	18,384	24,543	24,402
Rural				
3	11,178	16,297	22,484	22,245
4	10,229	15,581	20,360	19,868
5	9,653	15,318	21,650	21,565
6	9,011	13,973	19,161	18,248

Table 14. Percentage of Persons Aged 25 and Over Who Have Completed Some College or More in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	13.6	17.5	21.5	33.0
2	12.4	16.3	22.3	32.8
Rural				
3	12.6	14.6	19.4	28.9
4	13.3	15.6	21.6	29.8
5	11.4	13.5	18.6	26.9
6	13.0	14.7	19.2	26.5

Table 15. Percentage of Labor Force Unemployed in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	5.9	4.0	3.1	6.3
2	5.4	5.0	3.6	7.1
Rural				
3	5.2	6.9	4.5	8.5
4	5.5	6.8	4.7	8.9
5	5.7	6.4	4.2	8.9
6	6.6	8.4	5.4	10.0

Table 16. Percentage of Families in Poverty in County Types 1-6, New York State, 1950-1980

County Type	1950	1960	1970	1980
Metropolitan				
1	18.4	13.2	12.8	16.3
2	17.5	12.3	10.0	10.6
Rural				
3	22.6	16.7	11.1	11.2
4	27.7	18.6	14.0	14.2
5	31.2	18.8	12.5	12.0
6	34.2	24.4	16.3	16.0

especially those with limited urban influence, having higher unemployment levels. Moreover, these disparities appear to have sharpened over the past decade. In 1980, the counties with limited urban influence had an aggregate unemployment rate of 10.0 percent, by comparison with rates of 6.3 and 7.1, respectively, in the downstate and upstate metropolitan counties. Roughly the same configuration emerges in the data in Table 16 on percentages of families in poverty; the metropolitan counties have historically had lower proportions of families in poverty than have the rural counties. In 1980, the counties with limited urban influence had 16.0 percent of their families in poverty, the highest rate among the four rural county types. The major departure of the data in Table 16 from those in Table 15, however, was the sharp increase in the poverty rate in downstate metropolitan counties, which increased from 12.8 percent in 1970 to 16.3 percent in 1980. Thus, in 1980, the New York State county types with the highest levels of poverty were the most urban (the downstate metro) and the most rural counties. The lowest poverty rates in 1980 were observed in the upstate metropolitan counties.

D. Implications for the Interaction of Agriculture and Rural Communities

These New York State data suggest several tentative observations relevant to the contemporary relationships between farm structural and technological change and the socioeconomic condition of rural communities in the Northeast Region. First, the data reviewed above suggest that agriculture in New York State is by no means confined to highly rural counties (see Schertz, 1979, for a similar observation with respect to the Northeast Region as a whole). Table 12 indicates, moreover, that in terms of the value of agricultural products sold, the most dynamic agricultural counties in New York State have tended to be in the rural counties with extensive urban influence; this county type was the only one to have exhibited an increase in the value of agricultural products sold from 1970 to 1980 (in constant 1980 dollars). Moreover, the rural counties with limited urban influence exhibited a significant decline in the value of agricultural products sold from 1970 to 1980 (see Table 12). Thus, to the degree that the more rural and agricultural regions of New York are experiencing major changes in their agricultural sectors, these changes appear to be related more to the overall decline of the farm sector due to low-quality agricultural resources than to the dynamism of technological change, concentration of agricultural assets, and the replacement of family-type farms by larger-than-family or industrial-type farms.

Second, the nonmetropolitan population in New York State and in the Northeast in general (Schertz, 1979; Hines et al., 1975) has for several decades had a relatively "urban" economic and labor force structure. For example, in 1970 U.S. nonmetropolitan counties had 24.3 and 27.2 percent of their labor forces in, respectively, manufacturing and service employment (Hines et al., 1975:35). Table 5 above indicated that in 1970 all rural county types in New York State had in excess of 63 percent of their labor forces in the service sector, while Table 7 showed that for this same year all rural county types except the rural counties with limited urban influence had proportions of the labor force in manufacturing above the U.S. nonmetro county average. The combined services and manufacturing shares of the New York State rural county labor force in 1970 were all in excess of 90 percent, compared to 51.5 percent for U.S. nonmetro counties as a

whole. Put somewhat differently, the data reviewed above demonstrate that rural counties in New York State (and the Northeast) have a significantly lower share of their labor forces in agricultural and other extractive industries than do the other major regions (especially the North Central and West Regions; Hines et al., 1975:35). The major implication of these data is that New York State (and presumably Northeast) counties have, by national standards, a relatively low dependence on agriculture, and, given their already highly "urban" economic bases and labor force profiles, there are likely to be relatively few counties in the Northeast that will be highly affected by technological and structural changes in the farm sector.

Third, the data reviewed above do not suggest the existence of any striking patterns of socioeconomic decline among the nonmetro population that might be attributable to adverse impacts of farm structural change on rural communities. There remain relatively modest metropolitan/nonmetropolitan disparities in median family income, and income disparities among the four rural county types in New York State are similarly modest. Poverty rates among the rural county types remained virtually unchanged from 1970 to 1980. The only indicator of deterioration of the socioeconomic condition of the New York State nonmetro population was the sharp rise in nonmetro/rural unemployment rates from 1970 to 1980. These increases in unemployment rates, of course, paralleled national trends during the 1970s. There was, however, some evidence in Table 15 that there was a widening of metro/nonmetro disparities in unemployment rates in New York State during the 1970s; moreover, the highest unemployment rates in New York State were observed among the rural counties with limited urban influence. Nevertheless, the overall character of the data on the nonmetropolitan population in New York does not indicate that there has occurred any dramatic relative or absolute deterioration of the socioeconomic well-being of the rural population that might be attributable to adverse impacts of farm structural change on rural communities.

III. TOWARD A MODEL OF TECHNOLOGICAL, FARM STRUCTURAL, AND RURAL COMMUNITY CHANGE IN THE NORTHEAST

A. Preliminary Considerations

There has emerged over the past 10 years a significant empirical literature on the impacts of farm structural changes on rural communities in the U.S. (see, for example, the reviews and summaries in Harris and Gilbert, 1982; Heffernan, 1982; Buttel, 1983a). This literature, most of which has been inspired by the "rediscovery" and reissue of Walter Goldschmidt's (1978) **As You Sow**, has generally confirmed the fact that a cluster of changes that have occurred in the U.S. farm sector during the post-World War II period--technological change, the trend toward fewer and larger farms, the disproportionate decline of "family farms," the rise of industrial-type farming, decline of the farm population, and so forth--have tended to have adverse impacts on rural communities. It has been argued, however, that the "Goldschmidt thesis" likely does not hold uniformly across the farming regions of the U.S. and that this approach has significant theoretical and methodological limitations (see, for example, Buttel, 1982a; Hayes and Olmstead, 1984). Indeed, the bulk of the empirical research that has provided support for the Goldschmidt thesis has been conducted in states and regions in which there is a high dependence on

agriculture (e.g., Flora and Conboy, 1977) and/or in areas in which highly concentrated, industrial-type farming is much more prevalent than in the nation as a whole (e.g., MacCannell and White, 1984). Most importantly for our purposes, there has been only one such study in the Northeast Region which has been conducted in the general methodological tradition of the "Goldschmidt-thesis" literature--that of Swanson (1982), reviewed at some length in Appendix A--and this study was concerned with farm structural and rural community changes (in Pennsylvania) for the **1930-1960** period. Thus, our intention in this section of the report will be to develop an empirical model that estimates the applicability of "Goldschmidt-type" hypotheses to the experience of the Northeast's nonmetropolitan counties during the past decade.[1]

B. Development of the Model: Theoretical and Methodological Considerations

The model of farm structural and rural community change that will be estimated below can be said to be largely in the Goldschmidt tradition, at least insofar as research stimulated by Goldschmidt's **As You Sow** has primarily tended to emphasize areal ("ecological") data based on indicators derived from the Censuses of Population and Agriculture. Moreover, there is a relatively close correspondence of the model that will be examined below and the implicit model structure developed in **As You Sow** and in subsequent literature (bearing in mind that Goldschmidt's [1978] study had only two cases and was largely qualitative in nature).

The adoption of the major elements of the Goldschmidt-type model is not to ignore some of its major theoretical and methodological limitations. For instance, this model (and our elaboration of the model) ignores the reciprocal impacts between farm structure and rural communities--e.g., how community territorial expansion, property taxation, and provision of services affect its farming hinterland. Aside from some danger of misspecification of the model, we do not, however, feel that this limitation of the model is a major problem for our purposes, especially because our major interest is in the impacts of farm sector changes on rural communities (and not vice versa). There are, moreover, certain limitations of the original and many subsequent applications of the Goldschmidt model that can be rectified within the context of the approach taken here. For example, unlike Goldschmidt's original formulation, we will be able to: (1) include measures of two dimensions of technological change (mechanization and use of biochemical inputs), (2) utilize measures of farm structure that reflect recent trends toward dualism, and (3) consider dependence on agriculture and influence of urban-industrial context as, respectively, contextual and control variables (see Swanson, 1982).

The model we outline below has three principal theoretical-methodological assumptions. First, we assume that the properties that we will measure--ranging from indicators of technological and farm structural change to change in the size of the farm and rural populations and in the socioeconomic characteristics of rural areal aggregates--are, indeed, variable properties. That this is the case is implicitly supported by the fact that previous studies have been successful in identifying and explaining such variations and is supported more explicitly by the data reviewed above and by other studies (Gregor, 1982; Dorner, 1983).

A second, and more problematic, assumption is that these variables can be usefully measured at the county level. There is, of course, an obvious disparity between the conceptual language that we have employed--rural **communities** or **places** and their farming hinterlands--and that which is implicated in the use of county-level data; counties contain a large number of communities and typically exhibit a high degree of variation in the population sizes, economic bases, and other characteristics of communities. There are also certain within-county variations in agricultural structure, although given the general tendency in U.S. agriculture for regions or subregions to have a fairly high degree of homogeneity in farm structure (Cochrane, 1979; Gregor, 1982), this should not be a major problem. Nevertheless, the heterogeneity of community conditions within any particular county is a significant issue and a potential limitation of the present study. We would argue that this limitation can be approached in two ways. One is to urge caution that these results should not be used to infer **directly** how farm structure affects rural communities in the Northeast; if such impacts are detected in the model, it would be prudent to assume that the strengths of relationships are likely to be substantially variable across rural communities, depending upon their characteristics. A second approach to the limitation of a high level of ecological aggregation is to note that one of the theoretical premises of the model that is developed below--that farm structural impacts on rural communities are likely to be confined to communities that are highly dependent on agriculture--will cause us to limit our population to a set of counties that contain relatively little variation in the size of places. We will focus our analysis on a subset of **nonmetropolitan** counties in the Northeast and, further, will give principal emphasis to nonmetro counties in which **5 percent or more of county income is derived from agriculture.** Restricting ourselves to nonmetropolitan counties eliminates counties with places larger than 50,000 inhabitants (and, as well, eliminates counties in which a large number of persons commute to an adjacent metropolitan county for work). Further, eliminating those nonmetro counties with low proportions of income derived from agriculture should, in general, result in a deletion of counties with a high degree of spatial (community-level) and socioeconomic diversity. Thus the theoretical logic of this study serves to reduce the problem of within-county community heterogeneity that would otherwise reduce the generalizeability of the results.

The third broad assumption of the study is that recursive equations will be adequate for estimating the relationships among technological, farm structural, and rural community variables. This assumption of recursivity involves the notion that the relationships between variables are not, in the main, of two-way causality or, put somewhat differently, that the effects are largely if not entirely unidirectional. This assumption would appear to be warranted for two reasons. First, the logic of recursive equations has been applied successfully in previous research on this issue. Second, there is no existing research at the county level, to the best of our knowledge, which has demonstrated that the effects of rural community structure on farm structure are large or approach the strengths of relationships found in analyses postulating causality in the opposite direction.

The basic structure of the model we employ is set forth in Figure 1. The model is intended to set forth the general nature of relationships that

FIGURE 1. A Model of Technological, Farm Structural, and Rural Community Change in the Northeast, 1969/70 to 1978/80

Farm Technological Change →	Farm Structural Change →	Change in the Structure of the Farm Population →	Change in the Structure of the Rural Population →	Change in Community Socioeconomic Well-Being
Change in Mechanization		Size of the Farm Population, 1970*	Size of the Rural Population, 1970*	Change in % Families in Poverty
Change in Use of Fertilizers and Other Agricultural Chemicals	Change in the Proportion of Full-Owner Farms	Change in the Size of the Farm Population	Change in the Size of the Rural Population	Change in Median Family Income
	Change in the Proportion of Corporation Farms	Number of Full-Time Hired Agricultural Laborers, 1970*		Change in Retail Sales Per Capita
	Change in the Proportion of Part-Time Farms	Change in the Number of Full-Time Hired Agricultural Laborers		Change in Per Capita Property Tax Revenues
	Change in the Number of Workers per Farm			Change in Percentage of Housing Built Before 1940
				Change in the Unemployment Rate
Regional Socioeconomic Context		Dependence on Agriculture		
Percentage of Labor Force in Services and Manufacturing, 1970		Percent of Income Derived From Agriculture**		
Percent Urban, 1970***				

*Indicates that the variable is utilized only as an independent variable. The procedure of using both the 1970 level and the 1970-1980 rate of change as independent variables is utilized when it is likely that the rate of change and the initial level may have distinct causal effects.

**Equations will be computed among the total population of nonmetropolitan counties and among the subpopulation of nonmetropolitan counties in which 5 percent or more of income was derived from agriculture according to the 1975-1979 average annual percentage of labor and proprietor income derived from agricultural sources.

***The percent urban variable is deleted when change in the size of the rural population and indicators of change in community socioeconomic well-being are regressed on antecedent variables.

would be expected based on existing literature. As emphasized earlier, however, the relationships especially those involving community socioeconomic conditions, are not expected to be large. The model consists of five clusters of independent variables and one cluster of dependent variables. Five dependent variables are measures of change in community socioeconomic conditions. These dependent variables consist of differences (over a 10-year span) in: (1) the proportion of families in poverty, (2) median family income, (3) retail sales per capita, (4) per capita property tax revenues, (5) the unemployment rate, and (6) the percent of housing built before 1940.

The majority of the independent variables--the technological change, farm structural change, farm population change, and rural population change clusters--reflect a postulated causal logic, which is discussed below, involving the ways that change in the farm sector affects rural communities. The fifth cluster of independent variables reflects characteristics of the regional socioeconomic context of farm structure and rural communities and consists of measures of the proportion of the labor force in manufacturing and service sector employment, percent of the population living in urban places (i.e., with 2,500 or more inhabitants), and a dichotomous indicator of the proportion of income derived from agriculture (5 percent or greater and less than 5 percent).

The logic of farm technological and structural change and its possible impacts on rural community socioeconomic conditions is as follows. Two measures of technological change--change in the value of machinery and equipment per farm and change in the ratio of fertilizers and other agricultural chemicals to gross sales--are included as exogenous variables which reflect major causes of farm structural change through, respectively, labor displacement and increased capital-intensity. Changes in these two aspects of technology are seen, along with the regional socioeconomic context, to affect change in farm structure. Four aspects of farm structure are included: (1) a measure of the prevalence of family ownership of agricultural resources, (2) a measure of the prevalence of corporate operation of farms, (3) a measure of the prevalence of part-time farming, and (4) a measure of change in the composition of the farm labor force.

Further, technological change and farm structural change are seen to affect change in the structure of the farm population. Variables reflecting change in the farm population include indicators of: (1) change in the size of the farm population, and (2) change in the number of agricultural laborers employed for 150 or more days. Technological, farm structural, and farm population change are posulated to affect change in the size of the rural population. Finally, the five clusters of independent variables are seen to affect the five indicators of change in community socioeconomic well-being.

The definitions of all variables in the study and the data sources are given in Table 17. The procedures used in estimating the regression equations will be discussed in conjunction with the presentation of the results.

TABLE 17. DESCRIPTIONS OF VARIABLES USED IN THE ANALYSIS

NFEMPLOY measures the percentage of total 1970 employment in a county for which employment in the manufacture of durable and nondurable goods and employment in "selected services" accounted.

URBAN measures the percentage of the total 1970 population in a county which resided in urbanized areas or places with 2500 or more people.

MACHINERY measures the difference between the average value of machinery and equipment per farm between 1969 and 1978. It is measured in current dollars.

CHEMICALS measures change in the ratio between expenditures for fertilizer and agricultural chemicals and total agricultural sales in a county for the years 1969 and 1978. It is measured as change in the ratio of current dollars. We consider this to be a better measure of the "flow" of chemical inputs than an expenditure-per-farm measure.

SALES measures the percentage change in total gross farm sales for a county between 1969 and 1978. It is considered to be an indicator of differences in the quality of agricultural resources and change in the well-being of the local farm economy.

CORPORATE measures change in the percentage of all farms in a county which were operated under an incorporated form of ownership in 1969 and 1978.

FULLOWN measures change between 1969 and 1978 in the percentage of farms with sales of $2500 or more per year which are fully owned by the operating entity. The Census of Agriculture distinguishes between farms on which an operator owns all of the land in the operation, those which are partly owned and partly rented, and those on which all of the land is rented (tenant farms).

PART-TIME measures change between 1969 and 1978 in the percentage of farm operators who reported 100 or more days of off-farm employment.

WORKERS measures change in the number of regularly employed hired farm workers between 1969 and 1978. The Census of Agriculture distinguished a category of hired workers who have been employed for 150 or more days during the preceding year. Although this category includes many workers who are not actually employed full-time, year-round, we consider this category to include "regularly" employed farm workers, as compared to those who are employed on a casual or seasonal basis only. In the 1969 Census of Agriculture this category included only workers who were employed on farms with $2500 or more in agricultural sales, while the 1978 data file includes workers who were employed on all farms. The differences in the numbers of workers between 1969 and 1978 are likely to be somewhat artificially inflated due to the different method of reporting. However, the difference in method applies to all counties, and regularly employed workers in 1969

were employed predominantly on farms with sales greater than $2500, so we expect that the possibility of systemmatic bias is minimal.

WORKFARM measures change in the number of regularly employed hired workers per farm reporting hired labor expenditures. it is considered to be an indicator of change in the composition of the farm labor force.

FARMPOP measures change in the size of a county's farm population between 1970 and 1980. The definition of a farm changed during this interval, but we have no reason to expect that this change will systematically bias the results of our analysis.

RURALPOP measures change in the size of the total rural population of a county between 1970 and 1980.

RURALPOP% measures change in the percentage of a county's population which is classified as rural.

POVERTY measures change between 1970 and 1980 in the percentage of all families in a county which had below-poverty level incomes.

INCOME measures the difference in median family incomes for a county between 1970 and 1980. It is measured in current dollars.

RETAIL measures change in retail sales per capita for a county between 1967 and 1977. Total retail sales figures are available from the Censuses of Retail Trade for those years. The base population figures for computing per capita sales are the total county populations for 1970 and 1980, derived from the Censuses of Population for those years. All of the data are included in the data files for the County-City Data Book, 1972 and 1983.

HOUSING measures change in the percentage of housing units in buildings built before 1940. Change in the percentage of "old" housing units within a county between 1970 and 1980 was affected by the removal of old housing units from the total stock of available housing, and by the addition of new housing units built during the interval. The percentage of occupied housing units in 1970 which were built before 1940 was not available from the County-City Data Book data files. Thus, the number of pre-1940 housing units for 1980 was divided by the total number of occupied housing units in 1970 to obtain a measure for 1970. This does not take into account the removal of old housing stock, but the difference in percentages still serves as an indicator of the level of improvement in the total housing stock.

TAXES measures changes in the average per capita property taxes paid by county residents between 1967 and 1977.

UNEMPLOY measures change in the unemployment rate between 1970 and 1980.

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* Data were obtained from the data files for the County-City Data Book, 1972 and 1983 editions, for NFEMPLOY, URBAN, FARMPOP, FARMPOP%, RURALPOP, RURALPOP%, POVERTY, INCOME, RETAIL, HOUSING, TAXES, and UNEMPLOY.

** Data were obtained from the U.S. Census of Agriculture, 1969 and 1978, for MACHINERY, CHEMICALS, SALES, CORPORATE, FULLOWN, PART-TIME, WORKFARM, and WORKERS.

IV. RESULTS OF THE ANALYSIS

The results of the analysis are discussed in the following four subsections. The first discusses the relationships between technological inputs and change in the structure of farming in the northeast. Second, the impact of change in the farm sector on change in population size and composition is considered. Third, the effects of change in farm sector and population characteristics on changes in indicators of community well-being are discussed. A final subsection offers our summary and conclusions.

There are 217 counties in the northeast region, of which 107 are nonmetropolitan. The Census of Agriculture did not report figures for two of the nonmetropolitan counties because the number of farms in each county was too small to avoid disclosure problems.* The remaining 105 counties provide the basis for our analysis. We considered it important to distinguish a subset of counties which were judged to be the most dependent on the agricultural economy. Therefore we selected those counties in which five percent or more of the total income in the county was derived from agriculture (see Table 18). Each phase of the analysis was conducted for both the total number of nonmetropolitan counties and the subset of counties which we have labeled "agricultural." Thirty counties (only 29 percent of all the nonmetropolitan counties) fall into this latter category. Assessing the social impacts of change in agriculture in the northeast is difficult given the relatively minor role which agriculture plays in the local economies of most nonmetropolitan counties.

Variables used in the following analyses are measured as simple gain scores (the absolute value of change) over a nine- to ten-year period of time, with four exceptions. The two variables which measure regional socioeconomic context--percentage of the labor force in services and manufacturing (NFEMPLOY), and percent urban population (URBAN)--are measures of 1970 characteristics. A third exception is change in gross farm sales (SALES), which is measured as a <u>percentage</u> change between 1969 and 1978. The fourth exception applies to time-one measures of the dependent variables in the analytical models. These are included to control the effect that initial size differences on a dependent variable exert on differences in the gain scores associated with that variable.

There are several methods of modelling change analysis in a panel design (e.g., Kessler and Greenberg, 1981). The approach employed in the following analyses is one which emphasizes the relationships between contemporaneous changes in the independent and dependent variables, after differences in the initial sizes of dependent variables are statistically controlled. Coefficients for our independent variables do not refer to effects on <u>percentage changes</u> in the dependent variables over time, but rather to effects on <u>differences</u> between values of the dependent variables at time-one and time-two.

Table 19 displays means and information on the distribution of the variables used in the analyses. Because each of the variables measures change over a period of time (except NFEMPLOY and URBAN; see Table 17), the means and distributions offer insights into recent trends in a variety

*Hamilton, New York, and Nantucket, Massachusetts.

TABLE 18. PERCENTAGE OF LABOR-PROPRIETOR INCOME DERIVED FROM AGRICULTURE, FIVE-YEAR AVERAGE, 1975-1979, NONMETROPOLITAN COUNTIES IN THE NORTHEAST

Percent of Total Income	Number of Counties	Percent of Counties
Under 1	21	20.0
1.00-2.99	38	36.2
3.00-4.99	16	15.2
5.00 or more	30	28.6
TOTAL	105	100.0

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

TABLE 19. ALL VARIABLES INCLUDED IN THE ANALYSIS: MEANS, STANDARD DEVIATIONS, AND RANGE, FOR ALL NONMETROPOLITAN AND FOR AGRICULTURAL COUNTIES IN THE NORTHEAST

	County Type							
	All Nonmetropolitan				Agricultural			
Variables	Mean	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX
Farm Characteristics								
MACHINERY	19,863.39	7,142.20	5,096	36,907	25,178.57	5,330.72	16,927	36,907
CHEMICALS	1.59	1.81	-3.96	9.57	1.24	1.61	-3.96	5.48
SALES	.96	.55	-.19	4.62	1.19	.72	.42	4.62
CORPORATE	1.24	2.82	-18.89	11.11	1.41	1.21	-1.23	4.47
FULLOWN	-8.62	8.96	-54.44	26.98	-11.64	4.86	-26.14	-4.43
PART-TIME	1.04	6.42	-32.14	11.72	-0.56	5.13	-18.08	7.38
WORKFARM	.52	.47	-1.11	3.08	.65	.48	.18	3.08
Population								
FARMPOP	-706.68	745.52	-5,066	113	-990.53	720.64	-3,603	89
FARMPOP%	-.02	.02	-.11	.01	-.04	.02	-.11	.00
WORKERS	87.59	152.51	-696	807	168.50	155.03	-100	807
RURALPOP	4,907.73	6,213.98	-21,796	39,757	3,754.17	2,212.45	-451	9,773
RURALPOP%	.02	.06	-.28	.17	.02	.05	-.19	.17
Community								
POVERTY	-0.58	1.99	-7.50	4.07	-0.44	1.67	-4.24	4.07
INCOME	8,595.13	1,479.69	5,285	15,282	7,856.70	1,065.40	5,285	10,675
RETAIL	1,415.58	522.83	169.21	4,396.08	1,075.77	320.11	169.21	1,783.95
HOUSING	-11.82	5.63	-42.57	14.63	-12.32	3.60	-18.04	-5.70
TAXES	129.61	86.79	-156.00	408.00	108.90	60.54	6	233
UNEMPLOY	3.72	1.85	-.56	9.62	3.89	1.90	1.23	9.62
Contextual								
NFEMPLOY	36.90	9.13	18.10	60.70	35.16	7.21	25	52.80
URBAN	29.22	17.44	---	68.00	19.38	13.82	0	50.50

of changes in the characteristics of nonmetropolitan northeast counties. Each of the means is an estimate of the average difference between time 1 and time 2 measures of each variable. It is interesting to note the differences between the mean changes for all nonmetropolitan counties and agricultural counties. As expected, we observe no evidence of notable declines in socioeconomic indicators which might be attributable to change in the structure of farming.

In the analysis reported below, we refer to correlation coefficients and to models based on ordinary-least-squares regression techniques. Bivariate correlation coefficients are reported in Appendix B. The variables are measured in terms of simple gain scores; thus, the coefficients measure the relationships among contemporaneous changes in technology, farm structure, population, and community variables.

A. The Impact of Technological Inputs on Changes in Farm Structure

In a preceding section we outlined our rationale for expecting that change in technological inputs would not be significantly related to change in the indicators of farm structure. Table 20 reports the results of our assessments of these relationships. The standardized regression coefficients for the model allow us to compare the importance of each variable in each of the farm structure models. Our interest is focused on the effects of machinery and chemical inputs after controlling the effects of change in gross sales and change in the nonfarm sector.

Among all nonmetropolitan counties, change in the value of machinery and equipment per farm is negatively associated with change in full-owned and part-time farms. In other words, where the value of machinery and equipment has increased most, the percentages of full-owned and part-time farms have declined or increased least. However, it should be noted that the proportion of explained variance for each of these two models is quite low. The machinery coefficients predicting change in the percentage of corporate farms and change in the number of workers per farm are relatively small and insignificant compared to other variables in the models. Change in chemical inputs is negatively related to changes in the percentage of corporate farms and the number of workers per farm, and is positively related to change in the percentage of part-time farms.

The models which apply to the more agriculturally dependent counties reveal some differences in the patterns of association. Change in the per farm value of machinery and equipment is related to change in the farm structure indicators in essentially the same ways as it is for all nonmetropolitan counties; the coefficients, however, are relatively small. CHEMICALS is positively associated with change in full ownership, but is relatively insignificant in the model. The coefficient for CHEMICALS in the model for change in part-time farming indicates that this variable is the single best predictor of change in the model. Yet the total variance explained in three of the four farm structure models applied to the more agricultural counties is quite low, the exception being the model for workers-per-farm, in which change in gross sales provides a significant predictor of change in this indicator of farm labor force composition.

TABLE 20. STANDARDIZED REGRESSION COEFFICIENTS FOR MODELS PREDICTING CHANGE IN FARM STRUCTURAL VARIABLES, 1970-1980, FOR ALL NONMETROPOLITAN AND FOR AGRICULTURAL COUNTIES IN THE NORTHEAST

	Dependent Variables							
	CORPORATE		FULLOWN		PART-TIME		WORKFARM	
Independent Variables[1]	All Nonmetro	Agricultural	All Nonmetro	Agricultural	All Nonmetro	Agricultural	All Nonmetro	Agricultural
TIME 1	-.65**	.47*	-.60**	-.32	-.43**	-.54*	-.15	.15
CHEMICALS	-.18*	-.14	-.12	.29	.26**	.68**	-.32**	-.14
MACHINERY	.06	.26	-.24**	-.19	-.61**	-.41	.10	.04
SALES	-.19*	-.18	.00	.47	.10	.68*	.50**	.83**
NFEMPLOY	-.08	-.25	.03	-.10	.06	-.16	-.02	-.04
URBAN	.22**	.28	.12	.20	.10	.08	.18*	.07
$\bar{R}$-Squared	.61	.38	.44	.01	.27	.16	.49	.69

[1] Each of the dependent variables is measured as a simple gain score between 1969 and 1978, therefore a time-one control variable is introduced in each model. Variables measuring 1969 percentages of corporate farms, fully-owned farms, and part-time farms, and the number of workers per farm in 1969 are included in the CORPORATE, FULLOWN, PART-TIME, AND WORKFARM models, respectively.

* Unstandardized coefficients significant at $p < .05$.

** Unstandardized coefficients significant at $p < .01$.

B. The Impact of Change in Technology and Farm Structure on Change in Population Size and Composition

We expected that change in the size and composition of the population in nonmetropolitan counties between 1970 and 1980 would not be closely related to changes in farm sector variables over that time period. The relatively high level of rural-urban, farm-nonfarm integration in the northeast region suggests that change in the population variables has been due more to changes in the nonfarm sector than to changes in the farm sector. However, change in the number of hired farm workers in the labor force is expected to be related to changes in the structure of farming, and changes in farm sales and the percentage of incorporated farms are likely to be associated with change in the reliance on hired labor.

In Table 21, correlation coefficients are presented which estimate the relationships between each of the population and labor force variables and a number of indicators of farm and nonfarm characteristics. The first-order coefficients control for the influence of the initial size on change in the size of a population and change in the size of the hired labor force. The third-order coefficients (in parentheses) estimate correlations among the variables after the effects of initial size and nonfarm contextual variables have been controlled.

The trend toward increasing numbers of regularly employed hired farm workers appears to be associated with growth in the farm economy and with the mechanization of farming. Change in the percentage of incorporated farms, which can be considered an indicator of the changing scale of farm operations,[2] is not highly related to change in the number of workers, contrary to expectation. Increase in the number of hired workers is apparently occurring across farms of varying sizes and in areas where production is becoming more mechanized. However, in the more agriculturally dependent counties, where the mean increase in number of hired workers is greater, mechanization is less related to changing numbers of workers and change in total sales is much more highly related to the number of hired workers.

Change in the size of the farm population is also positively associated with mechanization and sales, although to a lesser extent. Changes in farm structure are not highly related to changes in farm population size, with one exception. The extent of full ownership within the farm sector is positively associated with farm population change in the more agricultural counties. Nonfarm employment is positively associated with change in the size of the farm population, even though change in the percentage of part-time farms is not.

None of the farm sector or contextual variables is related to change in the size of the rural populations of the total sample of nonmetropolitan counties to a significant extent. There is more evidence of such relationships within the agricultural segment of counties: Changes in sales and mechanization are negatively related to change in the size of the rural population. The coefficient for WORKFARM suggests that in the more agricultural counties the increasing scale of farm operations is associated with rural population decline or less rapid growth. Change in the rural populations of the most agriculturally dependent counties has been more

TABLE 21. FIRST-ORDER AND THIRD-ORDER PARTIAL CORRELATION COEFFICIENTS FOR THE REGRESSION OF CHANGE IN FARM POPULATION CHARACTERISTICS ON SELECTED VARIABLES, FOR ALL NONMETROPOLITAN AND FOR AGRICULTURAL COUNTIES IN THE NORTHEAST[1]

Farm Sector and Contextual Variables	Population Characteristics					
	WORKERS		FARMPOP		RURALPOP	
	All Nonmetro	Agricultural	All Nonmetro	Agricultural	All Nonmetro	Agricultural
FARMPOP	--	--	--	--	-.01(-.01)	.20(.17)
WORKERS	--	--	--	--	-.13(-.13)	-.21(-.24)
CORPORATE	.12(.11)	-.03(-.02)	.02(.00)	-.23(-.02)	-.12(-.12)	.24(.30)
FULLOWN	-.11(-.12)	.16(.15)	.07(.02)	.26(.33)	-.06(-.06)	.00(.02)
PART-TIME	-.14(-.14)	.05(.07)	-.13(-.11)	-.05(-.02)	-.19(-.19)	.12(.18)
WORKFARM	.68(.68)	.80(.79)	.12(.08)	.11(.11)	-.10(-.10)	-.23(-.25)
CHEMICALS	-.26(-.26)	-.58(-.57)	.06(.07)	-.08(-.03)	-.08(-.08)	.11(.13)
MACHINERY	.46(.47)	.09(.16)	.21(.22)	.01(.12)	-.03(-.03)	-.45(-.38)
SALES	.58(.59)	.73(.73)	.31(.27)	.33(.26)	-.07(-.06)	-.17(-.21)
NFEMPLOY	-.01 --	.14 --	.20 --	.21 --	-.03 --	.24 --
URBAN	.05 --	.20 --	.07 --	-.19 --	-- --	-- --
N	105	30	105	30	105	30

[1] First-order partials are reported in each column. They represent the correlation between a population change score and a farm sector change score or contextual variable, controlling the initial size of the population. Third-order partials, which control the influence of the urban and nonfarm employment contextual variables in addition to initial size, are reported in parentheses.

closely related to changes in the farm sector than it has been for nonmetropolitan counties generally.

To summarize, change in the general state of the agricultural economy and in mechanization are positively but modestly associated with change in the farm population and the regularly employed hired worker segment of the labor force. These four indicators have tended to increase and decrease together. Change in the total rural population has generally not been associated with changes in the farm sector, although the relationships are stronger in agricultural counties. Full ownership is positively related to farm population change, and within the agricultural counties corporate farming is negatively related to farm population change. With these exceptions, changes in the organizational structure of farming (incorporation, full ownership, part-time farming, and workers per farm) are generally not associated with population and labor force changes.

C. The Impact of Changes in Technology, Farm Structure and Population Characteristics on Change in Community Socioeconomic Well-Being

We have noted above that there are no striking patterns of social and economic decline evident in the nonmetropolitan counties of the northeast for which change in the agricultural sector might account. The extent of association between change in the farm sector and community changes is examined below in three ways. First-order and third-order correlation coefficients are reported in Tables 22 and 23. The first-order coefficients control the effect of initial size on the change score variable, and the third-order coefficients control the effects of the initial size and the two nonfarm variables. In Table 24, results of regression analyses are presented. Unstandardized coefficients are reported. The full model is fit for all nonmetropolitan counties. For the agricultural subset of counties, a step-wise regression technique was used to identify the best four-variable model for each of the community well-being variables. Preliminary regression analysis led to decisions to eliminate certain variables from the analysis. The technology variables (MACHINERY and CHEMICALS) did not have appreciable direct effects on indicators of community well-being when other factors were taken into account and they were eliminated from the list of independent variables. The model for change in the unemployment rate explained less than 10 percent of the variations in this indicator, thus it was dropped from the analysis also.

An interesting pattern emerges when considering the poverty and income models together. Change in the proportion of the farm population (FARMPOP%), the proportion of fully-owned farms (FULLOWN), and change in the vitality of the local farm economy (SALES) are all associated with improved community well-being. The coefficients and the direction of the relationships suggest that when the farm population declines as a proportion of county population, when the proportion of fully owned farms declines, or when total farm sales in a county remain relatively stagnant or decline, poverty rates tend to increase. The effect of corporate farming appears to be negative, on balance. Change in this variable is positively associated with the poverty rate and negatively associated with median family income, especially in the agricultural counties. Changes in full-ownership and part-time farmer percentages are positively associated with improved poverty rates and median family incomes, with full-ownership being

TABLE 22. FIRST-ORDER AND THIRD-ORDER PARTIAL CORRELATION COEFFICIENTS FOR THE REGRESSION OF CHANGE IN COMMUNITY WELL-BEING ON SELECTED VARIABLES, ALL NONMETROPOLITAN COUNTIES[1]

Farm Sector and Control Variables	Community Characteristics				
	POVERTY	INCOME	RETAIL	HOUSING	TAXES
RURALPOP%	.02(.07)	.05(-.01)	-.05(-.10)	.16(.03)	-.14(-.07)
FARMPOP%	-.21(-.17)	.20(.14)	.39(.32)	.06(-.10)	-.08(.01)
CORPORATE	.02(.03)	-.03(-.05)	.03(.00)	-.14(-.21)	.05(.06)
FULLOWN	-.25(-.21)	.22(.17)	.20(.15)	.12(.00)	-.06(-.01)
PART-TIME	-.14(-.15)	.24(.26)	.26(.27)	.06(.10)	.14(.12)
WORKFARM	-.08(-.05)	.05(.02)	.00(-.03)	.09(-.01)	-.13(-.10)
SALES	-.08(-.06)	.16(.13)	-.04(-.05)	.23(.17)	-.23(-.19)
NFEMPLOY	-.10 --	.14 --	.09 --	.38 --	-.26 --
URBAN	-.08 --	.12 --	.14 --	.25 --	-.12 --

N=105

[1] First-order partials are reported in each column. They represent the correlation between a community change score and a farm sector change score or contextual variable, controlling the initial size of the community variable. Third-order partials, which control the influence of the urban and nonfarm employment contextual variables in addition to initial size, are reported in parentheses.

TABLE 23. FIRST-ORDER AND THIRD-ORDER PARTIAL CORRELATION COEFFICIENTS FOR THE REGRESSION OF CHANGE IN COMMUNITY WELL-BEING ON SELECTED VARIABLES, AGRICULTURAL COUNTIES[1]

Farm Sector and Control Variables	Community Characteristics				
	POVERTY	INCOME	RETAIL	HOUSING	TAXES
RURALPOP%	.12(.00)	.00(-.04)	.01(-.08)	.45(.13)	.02(.08)
FARMPOP%	-.10(-.21)	.39(.36)	.48(.40)	.24(-.07)	.14(.11)
CORPORATE	.24(.18)	-.25(-.14)	.18(.22)	-.33(-.45)	.03(-.05)
FULLOWN	-.27(-.29)	.33(.35)	.03(.03)	.13(.13)	-.04(-.07)
PART-TIME	.16(.16)	-.01(.03)	.40(.42)	-.29(-.31)	.19(.12)
WORKFARM	-.43(-.44)	.40(.36)	.34(.32)	.08(.03)	.20(.24)
SALES	-.41(-.40)	.55(.48)	.38(.34)	.04(-.01)	.06(.10)
NFEMPLOY	.06 --	.24 --	.17 --	.39 --	-.23 --
URBAN	.22 --	-.07 --	.08 --	.50 --	.05 --

N=30

[1] First-order partials are reported in each column. They represent the correlation between a community change score and a farm sector change score or contextual variable, controlling the initial size of the community variable. Third-order partials, which control the influence of the urban and nonfarm employment contextual variables in addition to initial size, are reported in parentheses.

TABLE 24. UNSTANDARDIZED REGRESSION COEFFICIENTS FOR MODELS PREDICTING CHANGE IN SELECTED COMMUNITY CHARACTERISTICS, 1970-1980, FOR ALL NONMETROPOLITAN AND FOR AGRICULTURAL COUNTIES IN THE NORTHEAST

	Dependent Variables									
	POVERTY		INCOME		RETAIL		HOUSING		TAXES	
Independent Variables[1]	All Nonmetro	Agricultural	All Nonmetro	Agricultural	All Nonmetro	Agricultural	All Nonmetro	Agricultural	All Nonmetro	Agricultural
Time 1 Control	-.41*	-.36	.77*	.42	.75*	.39*	-.19*	-.22*	.94*	.94*
RURALPOP%	1.41	--	-262.07	--	37.22	--	3.11	--	-49.12	--
FARMPOP%	-9.42	--	2530.62	11503.17	8417.93*	6544.20*	-1.69	--	132.57	--
CORPORATE	.12	--	-86.34	-179.90	-3.20	--	.07	-1.38*	1.62	--
FULLOWN	-.07*	-.08	60.12*	--	4.94	-14.25	-.01	--	-.46	--
PART-TIME	-.02	--	32.98	--	15.34	18.12*	-.02	-.14	.54	--
WORKFARM	-.13	-1.18*	-375.21	--	24.25	--	-.58	--	4.73	48.96
SALES	-.13	--	585.46	580.32*	-59.09	--	.84	--	-26.61	-26.01
NFEMPLOY	-.01	--	15.67	--	.28	--	.19*	--	-1.58*	-1.97
URBAN	.00	.03	6.14	--	-2.00	--	.03	.17*	-.34	--
INTERCEPT	3.02	2.89	1630.70	4509.67	665.82	701.02	-8.48	.13	109.82	82.96
$\bar{R}$-Squared	.37	.40	.33	.41	.40	.61	.22	.63	.52	.69

1 Each dependent variable is measured as a simple gain score over a ten-year period, therefore a time-one control variable is introduced in each model. The poverty level in 1970 is included in the POVERTY model. Median family income in 1969 is included in the INCOME model. Per-capita retail sales in 1967 is included in the RETAIL model. The percentage of housing units built before 1940 which existed in 1970 is included in the HOUSING model. Per capita property taxes in 1967 is included in the TAXES model.

* $p < .05$

the most significant contributor to explaining change in these community variables.

Retail sales are related positively to changes in the farm proportion of the population. The strength of the association across both types of counties indicates that where the farm population declined, retail sales per capita tended to decline. Interestingly, the rate of change in farm sales appears negatively related to retail sales change, as does corporate farming, although both are statistically insignificant in the regression models. These relationships suggest that a dynamic agricultural economy does not necessarily contribute to local retail sales. Alternatively, change in part-time farming is significantly and positively related to change in retail sales within the agricultural segment of counties.

Change in housing quality appears to depend more on nonfarm influences than on the farm sector variables. Nonfarm employment is associated with poorer housing across all nonmetropolitan counties, and percent urban population is related to housing in the same way for agricultural counties. The overall quality of housing does not appear to have been affected by change in the farm sector, although there is some indication that where the farm percentage of the population has declined, housing conditions have not improved as much as elsewhere.

Beyond the contributions of variables measuring the initial scores on the dependent variables, change in the percentage of full-owned farms was the most important variable affecting changes in the poverty rates and median incomes. Where proportions of fully-owned farms have declined, incomes and poverty rates have tended not to improve as much as elsewhere. Alternatively, where full-ownership has increased as a proportion of all farms, median incomes have tended to increase and poverty rates have tended to decline. Part-time farming is associated with incomes and poverty in the same ways.

Farm structure variables have significance in other respects. The most important variables explaining change in per capita retail sales were change in the farm population and change in the percentage of part-time farms. Each of the models indicate that change in the farm structure variables is relatively important to explaining changes in indicators of community well-being, but the goodness-of-fit statistics cause us to introduce a note of caution. Much of the variation among nonmetropolitan counties in the northeast remains unexplained by the models which we have introduced in this analysis.

D. Summary

Our hypotheses have generally been confirmed by the results of our analysis. We did not expect the technology variables to be related to changes in farm structure, nor did we expect significant relationships between the agricultural variables and changes in the sizes of farm and rural populations.

Our models assessing the impact of technological inputs on farm structure account for little of the variance in the dependent variables after the effects of initial size are considered. The directions of the relationships between mechanization and farm structure variables are as

expected, and the negative relationships between mechanization and full ownership and part-time farming are statistically significant. Chemical inputs are negatively related to indicators of changes in farm scale (CORPORATE and WORKFARM), contrary to expectations. Perhaps large-scale farms already in 1969 relied heavily on chemical inputs and thus increased least over the ten-year period. Given the poor fit of the models, we have little evidence to suggest that changes in technological inputs over the ten-year period covered in this study have had a major impact on changes in farm structure. This period may not have been a time of major structural change in northeast farming and limiting our analysis to it may result in an underestimation of the influence of technological change on farm structure.

In our models of farm and rural population change, we see little evidence of impacts due to change in other farm sector variables. The strongest evidence is that for the impact of change in fully-owned farms, which is positively associated with farm population change, especially in the most agriculturally dependent counties. Where part-time farming is increasing there is no evidence that this trend contributes to growth or stability in the farm and rural populations of these counties. Generally the farm sector variables contribute little to explaining variation in measures of farm and rural population change.

The models for predicting change in community well-being do, nonetheless, reveal some surprisingly consistent patterns of association between changes in the farm sector and other socioeconomic changes in nonmetropolitan areas. The relationships between change in full-ownership and in poverty and income suggest that this aspect of farm structure is an imimportant correlate of economic well-being, particularly in the most agriculturally dependent counties. Change in part-time farming is also associated with indicators of economic well-being and appears to contribute significantly to retail trade activity in agricultural counties.

These patterns suggest that even in the northeast, where urban and other nonfarm influences on the farm sector have been substantial for some time, we can still identify correlations between indicators of farm structure and indicators of well-being in the general community. Yet we do not have conclusive evidence regarding the significance of the changing composition of the farm sector; in particular, a trend toward large-scale production units in agriculture does not necessarily imply detrimental consequences for rural communities in the Northeast. Corporate farming does not appear to be a significant independent influence on community well-being. But the trend toward decline in the proportion of fully-owned farms would imply negative consequences based on our analysis. Our data offer little evidence that changes in the scale of farming or the form of legal ownership have had important impacts on the quality of life in rural areas of the northeast. However, tenure and the relative size of the farm population do appear to have important impacts on overall community well-being.

V. THE IMPACT OF EMERGING TECHNOLOGIES ON FARM STRUCTURE AND RURAL COMMUNITIES IN THE NORTHEAST

The preceding discussion has outlined historic changes in farm structure and rural community impacts in the Northeast and the determinants of

those changes through the early 1980s. In the years ahead, a wide variety of developments in technology and public policy will have continuing impacts on agricultural production, farm structure, and the rural environment in the Northeast. Before discussing these changes in detail, it is first necessary to identify those types of technological changes which are likely to be particularly important in the Northeast.

A. Major Types of Emerging Technological Developments

In the Northeast, as in the nation as a whole, emerging technological changes in production agriculture can be grouped into several major categories.[3] **Biological technologies** utilize living organisms or their components in the improvement of animal and plant production. Animal production technologies include: genetic engineering techniques (recombinant DNA, monoclonal antibody production, embryo transfer); regulation of animal growth and development; animal disease control (use of rapid diagnostic tests, selection for disease resistant strains, genetic engineering); animal pest control (integrated control systems, vaccines, slow-release insecticides, etc.); animal reproduction technologies (estrus cycle regulation, embryo transfer, etc.); and developments in animal nutrition. Emerging biological crop production technologies include some of the same general types of technologies important in animal production (genetic engineering, growth regulators, disease and pest control), but also other developments unique to plant production: biological nitrogen fixation; enhancement of photosynthetic efficiency; management of insects and mites (through chemical control and genetic engineering); and weed control (new biocontrol agents, improved crop cultivars, etc.).

A group of **mechanical technologies** will also have an important influence on increasing the efficiency of agricultural production in the future. In animal production, these mechanical technologies include developments in the areas of: environment and animal behavior (energy conservation, optimization of stress, regulation of immune processes, photoregulation of physiological phenomena); crop residue and animal waste use (residue conversion, manure application and conversion, etc.); and robotic applications (management of feeding and reproduction, pregnancy checking, etc.). In plant and crop production, robotic applications are also likely (for example, in the harvesting of selected high value crops), but other mechanical technologies will also be important. Engine and fuel technologies, including the development of adiabatic compression ignition engines with turbocompounding, electronic engine controls, and alternative fuels will enhance agricultural productivity. Developments in crop separation, cleaning and processing will increase crop productivity, particularly for grains.

Several types of developments in **information technologies** will have major impacts on agricultural production systems, both crop and animal. A number of communications and information management technologies will provide greatly increased amounts of information to agricultural decision-makers and do so to permit its more efficient use. These technologies include local area communications networks and private business exchanges, more sophisticated data terminals, and a variety of software systems for database management, financial analysis and on-farm system management. Monitoring and controlling techniques, including developments in sensors,

controllers, displays, and actuators will reduce plant and animal production costs and increase productive efficiency. Telecommunications technologies such as developments in fiber optics, digital communications, videotex, and personal computers will enhance the efficiency of information transfer.

Finally, although many of the technologies discussed above relate directly or indirectly to increasing management efficiency, a group of specific management techniques will enhance agricultural efficiency, particularly in the use and management of productive inputs. Water and soil-water-plant management technologies, ranging from advances in irrigation techniques to developments in plant breeding and biotechnology, offer considerable promise, especially if technological developments are integrated across scientific disciplines. Developments in the management of soil erosion, productivity and tillage, including conservation tillage and the reclamation of eroded soils, will also prove important, although technological developments in these areas will likely be of secondary importance relative to providing sufficient incentives to farmers through public policy changes to encourage the adoption of soil conservation practices. Lastly, a variety of other land management technologies and techniques will continue to prove important in increasing agricultural productivity. These techniques include multiple cropping, organic farming, controlled traffic farming and custom prescribed tillage.

B. Emerging Technologies: Implications for the Northeast

The applications of these four groups of technologies (biological, mechanical, information and management) are likely to have widely different impacts on various regions of the U.S. due to regional variation and specialization in crop and animal production and associated differences in farm management practices and farm structure. Consequently, it is important to specifically consider those crop and animal products which are particularly important in the Northeast and, thus, which technologies can be identified as likely to have particularly important effects on Northeastern farming and farm structure.

While technological changes in the production of important regionally-produced commodities such as poultry products and selected fruits and vegetables will have significant implications, the prospects for technological change in the dairy industry will be especially important. As stated previously, dairy production is by far the dominant agricultural industry in the Northeast region, accounting for 44 percent of cash farm receipts in 1982. While a number of the aforementioned categories of technological changes will affect the dairy industry in the years ahead, including embryo transfer, computer-based feeding and management, and alternative forms of waste conversion, two specific technological developments stand out in their potential impact on the dairy industry: (1) the commercial introduction of synthetically produced bovine growth hormone (bGH); and to a lesser extent, (2) the potential on-farm use of ultrafiltration and reverse osmosis (UF and RO) technologies.

Bovine growth hormone is a protein produced by the pituitary gland of a dairy animal which helps control the quantity of milk produced. Bovine growth hormone can also be produced through recombinant DNA procedures and,

like the naturally occurring hormone, injected into dairy animals to stimulate milk production (Bauman et al., 1982). Commercial introduction of bGH, which is currently awaiting FDA approval, is likely well within this decade. Preliminary research trials at Cornell University have yielded increases in production per cow ranging between 10 and 40 percent depending on the stage of lactation, the latter figure corresponding with a roughly 25 percent production increase over the entire lactation (Kalter et al., 1984). While commercial introduction is unlikely to result in average yield increases of this magnitude, production increases obtainable by efficient dairy producers are likely to be sizeable. In addition, per unit production costs of synthetically produced bGH are estimated to be moderate. If these estimated costs are reflected in a competitively priced product for the dairy producer, the magnitude of the potential net gains from adoption suggests that considerable incentives will exist for farmers of all sizes to adopt bGH technology (Kalter et al., 1984).

The likelihood of on-farm use of ultrafiltration and reverse osmosis technologies[4] (UF and RO) is also of potential importance in the Northeast. Ultrafiltration concentrates fluid milk by removing water and some solid components. Reverse osmosis removes simply water from fluid milk. A third process, thermalization, can be used to both extend the on-farm storage life of milk and enhance cheese yields through heating milk directly after milking to a temperature below that required for pasteurization. Combinations of these technologies offer the promise of permitting on-farm storage of milk in greater quantities and for significantly longer periods. The advantages to the producer would be in reduced storage costs (per unit of fluid milk equivalent) and lower assembly costs, and, at the plant, in higher cheese yields. To date, application of UF and RO technologies has been confined to dairy manufacturing plants, although its spread to a portion of those dairy farms sufficiently large to afford the high initial fixed equipment costs is possible.

Technological changes in the production of other commodities of importance to the Northeast are also inevitable. In poultry production (both broilers and eggs), for example, continuing increases in production efficiencies can be expected through genetic improvements in breeding, computerization of feeding systems, and technological advances in egg handling and meat processing. In fruit and vegetable production, productivity increases may be expected to continue with the use of improved seed and tree varieties, more efficient management practices, computerized grading and packing equipment, and especially through the development and more widespread use of advanced mechanical harvesting technologies. High capacity harvesting equipment is increasingly used in the harvesting of such vegetable crops as peas, sweet corn and snap beans and fruits such as tart cherries and grapes among larger producers in the Northeast. To a large extent, the capacity of harvesting equipment defines the upper limit to a fruit or vegetable producer's size of operation. As these technologies continue to develop, the size of efficient farming operations will increase with important structural implications for the industries affected (particularly in vegetable production). Overall, however, it can be expected that technological changes in these industries will not have impacts of the same magnitude as changes in the dairy industry.

C. Impacts of Emerging Technologies on Agriculture

The impacts of the abovementioned technologies on animal and crop production yields and efficiency will be sizable in the Northeast as in the nation. In dairy production, for example, the Office of Technology Assessment projects increases in milk production per cow of nearly 14 percent by 1990 and 43 percent by the year 2000 over 1982 levels, assuming a most likely "baseline environment" for changes in technology (OTA, 1985b, p. 14). In poultry, projections of increases in egg production per layer are more modest, 5.3 percent and 12.2 percent by 1990 and 2000, respectively (over 1982 levels), under the same scenario. In both cases, but especially in the case of poultry, rates of feeding efficiency are projected to increase significantly. Yields of corn grain, an important input for dairy and poultry production in the Northeast, are projected to increase by 3.4 percent in 1990 and 20.9 percent by 2000 under the same conditions. Although specific projections for other products such as fruits and vegetables are not available, a continuation of existing trends in yield and efficiency increases can generally be expected.

Given the relatively inelastic demand faced by most agricultural commodities, these increases in productivity have potentially serious consequences for the balance between supply and demand for specific food products and for the structure of agricultural production in the Northeast. In examining these implications, three types of technological impacts can be highlighted: (1) absolute changes in the use of capital and labor inputs and in their relative use; (2) differential technological adoption rates by different sized farms; and (3) likely impacts on structural elements such as vertical coordination, producer control, market access, and barriers to entry. Each of these is considered below.

D. Input Requirements

Table 25 outlines the potential changes in capital and labor (including management labor) employed and the capital/labor ratio in animal and plant production by the year 2000, assuming the adoption of the various packages of technologies listed in the first column (and discussed above). The importance of the dairy industry in the Northeast means that changes in input usage and in the capital/labor ratio for animal (dairy) production will be especially important in determining the future demand for capital, labor, and land inputs in Northeastern agriculture. Overall, assuming likely rates of technological adoption, a moderate increase in capital input requirements for animal production is projected for the nation (Table 25) and, by extension, for the region. With a continuation of the historical trend of decreasing labor requirements, the result is a projected slight to moderate increase in the capital/labor ratio in animal production agriculture.

Underlying these general trends, certain specific impacts on production input requirements at both the farm and aggregate levels may be expected to result from the adoption of bGH, in particular. Preliminary analysis of potential farm-level impacts of bGH adoption indicates that total feed requirements will likely increase, though at a lower rate than milk production, following bGH introduction and that these enhanced production levels will require (under certain assumptions) higher energy rations

and increased feeding of concentrates (Kalter et al., 1984). At the farm level, the same analysis shows that marginal returns to land and associated machinery inputs are generally constant, though increasing to cows and buildings.

The aggregate or regional implications for input requirements are more difficult to ascertain but even more critical. In the short run, the increased demand for concentrates, corn grain in particular, would no doubt increase the feeding of on-farm or locally produced corn with two results: decreasing off-farm sales of feed in many cases, and increasing the relative value of high quality cropland relative to more marginal land in specific regions. Decreased sales of feedstuffs off the farm could affect the movement of currently "surplus" feed from areas such as western New York to importing regions like New England, thus changing existing feed distribution patterns in the Northeast. Given the limited amount of high quality farmland in the region, the demand for (and price of) this land would likely increase and the competitive position of farms located in these areas (western New York, the Connecticut River Valley, and southeastern Pennsylvania, for example) would likely be enhanced.

In the long run, the impacts of bGH adoption on input requirements will clearly depend on the forthcoming adjustments in the dairy industry vis-a-vis numbers of farms, size of farms, milk prices, etc. Significant increases in milk production per cow would presumably result in a downward adjustment in cow numbers in the Northeast, given the generally inelastic demand for dairy products. This would result in a lowering of feed requirements necessary to meet dairy animals' maintenance rations, offsetting, to some extent, increased per cow feed requirements. The net effect is uncertain, but again might likely be an increase in the relative feeding of high energy feedstuffs and concentrates and an increase in the relative value of those resources (e.g., high quality cropland) necessary to produce those feed requirements.

The adoption of OF and RO technologies would have a much more predictable impact on input requirements. Adoption of these associated technologies would no doubt increase the capital requirements on adopting farms due to the substantial capital investment involved, and increase the capital intensity of the dairy operation.

A moderate increase in the demand for capital inputs is also projected for plant and crop products grown in the Northeast region, primarily corn and fruit and vegetables. Although biological and mechanical technologies may be expected to have little impact on capital versus labor usage, both information and management technologies are projected to be more capital intensive (Table 25). Even with these changes, the emerging technologies will likely be relatively less capital intensive in crop production than in animal production. Importantly, as a result of the abovementioned developments, the historical pattern of steady or lower farm employment but higher capital requirements in Northeastern production agriculture should be expected to continue into the future.

E. Rates of Technological Adoption

A second issue, the rate of adoption of new technologies by different sized farm operations, will also have a major impact on the future farm

Table 25. Potential Impact of Technology Groups on Capital and Labor at the Producer Level, Assuming Adoption, by Animals and Plants, Agricultural Structure Group.

Area and Technology Group	Potential Additional Change Induced by Technology Group by Year 2000 in		
	Capital	Labor	Capital/Labor Ratio
Animal			
Biological Group	Slight decrease (<5%)	Slight decrease (<5%)	No significant Change
Mechanical Group	Moderate Increase (5-10%)	Slight Decrease (<5%)	Moderate Increase (5-10%)
Information Group	Moderate Increase (5-10%)	Slight Increase (<5%)	Moderate Increase (5-10%)
Plant			
Biological Group	No Significant Change	Slight decrease (<5%)	No significant Change
Mechanical Group	Moderate increase (5-10%)	Slight increase (<5%)	No significant Change
Information Group	Moderate increase (5-10%)	Slight increase (<5%)	Moderate increase (5-10%)
Management Techniques Group	Slight increase (<5%)	Moderate increase (5-10%)	Slight increase (<5%)

Source: Office of Technology Assessment, "Synopsis: Agricultural Structure Group."

structure of the Northeast. Table 26 summarizes the likely ranges of national adoption rates of different packages of technologies by farm operations of different size categories (measured by sales). Regardless of the type of commodity or technology group, the trends in relative rates of adoption of the different technologies are similar: larger farm operations are more likely to adopt new technologies (and presumably at a faster rate). Since early adopters generally realize greater benefits from adoption than those who adopt late, larger farms may be expected to realize proportionately greater benefits from new technologies than small farms, overall, and thus may gain an additional competitive advantage.

In the dairy industry specifically, information currently available regarding the likely rates of adoption of bGH by dairy farmers basically corroborates the above conclusions. Preliminary survey findings from New York indicate that bGH adoption rate is likely to be widespread and relatively rapid (80 to 90 percent adoption within three years), and that the early adopters are likely to be those with the larger herds (Kalter, et al.). If the larger producers are the first to realize the benefits from adoption, they will be in an increasingly advantageous position relative to smaller operations. Their per unit costs of production will decline prior to offsetting output price declines, earning them short-run quasi-rents. Late or non-adopters would be placed in an increasingly non-competitive position over time, especially if the results of non-adoption exacerbate previous poor management practices.

Although similar information on the potential adoption of UF and RO technologies is not available, the large capital outlays associated with the adoption of these technologies suggest that the early adopters again would, to an even greater extent than with bGH, be the large producers. Together, these developments imply a continuing trend toward increased size of operation in the dairy industry in the Northeast.

F. Structural Changes in Agriculture

The impacts of technological change on such structural characteristics as vertical coordination and control, market access, and barriers to entry in Northeastern agriculture are more difficult to ascertain (see Table 27). Although the projections in Table 27 do not permit many definitive conclusions regarding changes in these structural elements, two points of particular relevance to the Northeast should be noted. First, for crops such as selected fruits and vegetable products, the yield-enhancing impacts of biological, mechanical and management technologies may well result in more vertical contracting across production and marketing sectors. Thus, greater vertical coordination and producer control, larger farm size and higher barriers to entry would be expected.

Second, in the dairy industry, the likely **de facto** bias toward larger farmers in the adoption of bGH, UF and RO and information technologies strongly suggests that average farm size and thus barriers to entry will increase. There is no inherent scale bias in the adoption of bGH technology itself. Small farms could theoretically adopt the technology as quickly and completely as large farms. However, the actual production-enhancing effects of bGH adoption are likely to be highly dependent on the individual producer's management ability and the overall efficiency of the

Table 26. Percent Adoption Rate of At Least One Technology Within a Technology Group By Size of Farm, Year 2000.

Area and Technology Group	Adoption Rate Range, by Sales Size Category (1984 Constant Dollars)			
	Less than $20,000	$20,000-$99,999	$100,000-$499,999	$500,000 or more
	-- Percent --			
Animal				
Biological Group	10-20	30-40	60-70	80-90
Mechanical Group	0-10	10-20	40-50	70-80
Information Group	0-10	10-20	55-65	80-90
Plant				
Biological Group	40-50	60-70	85-95	90-100
Mechanical Group	0-10	10-20	40-50	70-80
Information Group	0-10	15-25	55-65	75-85
Management Techniques	10-20	30-40	55-65	70-80

Source: Office of Technology Assessment, "Synopsis: Agricultural Structure Group."

Table 27. Potential Directional Impact of Technology Groups on Structural Elements at the Producer Level, by Animals and Plants, Agricultural Structure Group.

Area and Technology Group	Potential Additional Change Induced by Technology Group by Year 2000 in		
	Vertical Coordination and Control	Market Access	Barriers to Entry
Animal			
Biological Group	Closer Coordination Encouraged	Slight Reduction	no significant Change
Mechanical Group	No Significant Change	No Significant Change	No Significant Change
Information Group	No Significant Change	Slight Increase	Slight to Definite Reduction
Plant			
Biological Group	Slight Encouragement of Closer Coordination	no significant Change	no significant Change
Mechanical Group	No Significant Change	no significant Change	slight increase
Information Group	No Significant Change	Increase	no significant Change
Management Techniques Group	No Significant Change	no significant change	slight to moderate increase

Source: Office of Technology Assessment, "Synopsis: Agricultural Structure Group."

farming operation. To the extent that management ability is positively correlated with farm size, larger producers would be expected to gain relatively more from bGH adoption. This would be particularly true if bGH dosages were administered through implants rather than through more labor intensive injections. Scale economies in associated farm activities such as crop production could reinforce the competitive position of the larger producer relative to the smaller one, and further raise entry barriers.

The impacts from the adoption of information technologies are less straightforward. Although communication and computer-related technologies can be viewed as scale-neutral, as with other capital inputs, it is likely that the technologies which generate the greatest production efficiencies will be those which are the most costly, most easily affordable by larger farmers, and thus entry barriers may again be increased. In the dairy industry, for example, sophisticated herd management information systems may increasingly enable very large producers to process large amounts of production, feeding, health and reproduction data on individual cows and manage the herd accordingly, an advantage generally associated with the small producer. Given the historical structure of the dairy industry in the Northeast, however, although entry barriers may remain high and further increase, it seems unlikely that major changes in vertical coordination and market access will be experienced, unless significant institutional changes in product marketing are forthcoming.

G. Farm Structural Changes: Summary

The impacts of technological change discussed above (on production input usage, adoption rates, and specific structural elements) suggest a fairly straightforward set of implications for Northeastern farm structure in the coming years. The number of small part-time farms in the region may remain relatively stable in the years ahead somewhat independent of technological and policy developments in commercial agriculture. This is likely to be the case for several reasons. First, small part-time farms in the region tend not to have dairy enterprises (Buttel and Gertler, 1982), which as emphasized earlier, is the sector in Northeast agriculture in which the most dramatic technological and farm structural changes are expected. Second, small part-time farms depend relatively little on farm income so that adverse changes in their relative position in the farm economy are unlikely to significantly threaten their survival. In commercial agriculture however, the productivity and yield increases related above combined with a relatively inelastic domestic demand for most food products and relatively modest prospects for export market expansion for products produced in the region, together suggest a decline in the number of farms needed to produce a fairly stable output. In dairy, given the likely growth in bGH usage, among other changes, the number of cows required for milk production will almost certainly continue to drop, in some areas perhaps quite sharply. In some selected fruit and vegetable products, the potential for import substitution may lead to increased production of locally produced foods. Poultry (e.g., broiler) production can be expected to increase.

The structural implications for the regional farm size distribution are also fairly clear. If the number of small part-time farms remains comparatively stable, this group may increase as a percentage of

Northeastern farms. Among commercial farms, the implications of an increasing capital/labor ratio and associated cost requirements, differential rates of technological adoption with the resulting distribution of benefits, and the concurrent impacts on vertical coordination, market access, and entry barriers are similar. These developments uniformly suggest an increasing average size of operation and an increasing concentration of farm sales among a decreasing number of larger farm operations. In this manner, farm structure changes in the Northeast will likely ressemble those occurring nationally.

Several factors will make developments in the Northeast different from those in the nation, however. To begin with, the implications of the projections cited above suggest strongly that the structure of animal production agriculture will change to a greater extent than that of crop production agriculture. Thus, the Northeast may be especially affected by developments such as the commercialization of bGH. However, the farm structural changes reviewed above, though resembling national developments, will develop from a different base; in other words, because Northeastern farms are, on average, considerably smaller than the national average and because of the "non-industrial" nature of dairying, increases in average farm size and sales concentration may not have the same perceived negative effects as in the nation. Finally, as mentioned previously, because the agricultural industry throughout much of the Northeast exists within an overall urban-industrial environment, the structural changes foreseen here will likely not have as serious consequences on, for example, input industries or local economies as in other regions, where the farm sector is the dominant local economic sector.

H. Impacts on Rural Communities: Implications for Public Policy and An Estimate of the Number of Rural Places that will be Affected by Future Technological Changes

The literature review and results of the empirical study in the preceding sections of this report provide the overall context for evaluating future agricultural policies and their impacts on the nonmetropolitan population and rural communities in the Northeast. The major conclusions that we have drawn about technology, farm structure, and rural communities in the Northeast are as follows.

First, historical and contemporary data underscore the fact that the nonmetropolitan population in the Northeast region is, in absolute terms and relative to the nonmetro populations of other regions, relatively privileged in terms of having high income levels, low levels of poverty, and favorable access to public services. Second, the Northeast region has relatively few counties that, by national standards, could be considered "agricultural counties." Late-1970s data show that only one county in the Northeast had in excess of 20 percent of labor-proprietor income derived from agriculture--the criterion that is generally used by USDA and other researchers to identify agricultural counties in the U.S. Of the 217 counties in the Northeast, 107 were considered nonmetropolitan in 1980, and only 30 of these nonmetropolitan counties had 5 percent of more of labor-proprietor income derived from agriculture in the late 1970s. Thus, to reiterate, nonmetropolitan counties in the Northeast generally now have a relatively low dependence on agriculture.

Third, we found that technological change--mechanization and use of purchased soil amendments and other agricultural chemicals--had relatively little impact on change in farm structure in the Northeast during the 1970s, at least insofar as spatial variations in technological change were not associated with spatial variations in farm structural change. This empirical observation is likely accounted for by several factors:

a. Technological change in the Northeast was not rapid during the 1970s by comparison with national trends. In part, this may be due to the fact that new technologies adopted in the 1970's were applicable primarily to commodities largely produced elsewhere in the country.

b. Farm structural change in the Northeast would appear to be caused more by the character of agricultural resources in the region (the prevalence of low-quality soils, short growing seasons, and other factors that limit agricultural productivity) and by the nonfarm factors that were discussed earlier in the report. In particular, it would appear that the central factor affecting Northeast farm structure is the tendency toward the marginalization and disappearance of farms with low-quality agricultural resources. It does not appear that emerging agricultural technologies will significantly affect the fact that the region's soil resources are, on average, lower in quality than those of cropland in other regions.

Two important qualifications to this result must be noted, however. First, the fact that the farm structure impacts of technological change in the Northeast during the 1970s were relatively moderate does not lessen the importance of prior technological and structural changes in the 1950s and 1960s. As noted previously, the post-World War II era in general has witnessed an extraordinary degree of change in agricultural production technology and in farm numbers, size and structure throughout the U.S., including the Northeast. Second, the predominance of dairying in the Northeast farm economy, the likelihood of rapid -- perhaps unprecedented -- technological change in this industry over the next 10 to 15 years, and the inevitability of changes in national dairy policy all suggest that future changes in farm structure in the Northeast will likely be significant.

Our fourth and final conclusion was that during the 1970s there was only modest evidence of impacts of farm structural change on rural communities, even in the most agricultural counties in the region. Moreover, technological change did not appear to have major direct or indirect effects on the socioeconomic character of agricultural counties and rural communities in the Northeast. To be sure, in the relative handful of Northeast counties with 5 percent or more of labor-proprietor income derived from agriculture, there were some modest associations between farm structure and workforce variables and indicators of rural community well-being. But, on the whole, the nonmetropolitan social fabric in the Northeast region has generally been only modestly affected by agricultural technology and farm structure changes over the past decade. Again, though, it is virtually certain that there will be a major wave of technological change in Northeast dairying over the next decade or two. This pattern of technological change will clearly have major impacts on the farms and nonfarm agribusinesses in the region and, more than likely, will have some significant effects on small agricultural trade centers in the more agricultural, dairy-dominated nonmetro counties. We estimate that perhaps 180

rural communities might be so affected over the next 10 to 15 years. This estimate is based on the fact that there exist 30 counties with 5 percent or more of labor-proprietor income derived from agriculture and that there are, on average, a half dozen agricultural trade centers in each county. Nonetheless, the available evidence suggests that future technological change in Northeast agriculture will affect the nonfarm agribusiness sector far more than it will affect the nonmetropolitan population or small rural communities in the Region.

VI. FUTURE PUBLIC POLICY ALTERNATIVES AND THE STRUCTURE OF AGRICULTURE IN THE NORTHEAST

A. Farm Structure Scenarios

Whether the trends and projections discussed above in fact extend to the future depends on the likely future impacts of changes not only in technology but in institutions and public policy, and the extent to which developments in the Northeast mirror or diverge from national trends. This section discusses possible farm structure changes in the Northeast and related policy issues under three alternative policy scenarios. Scenario 1 assumes a continuation of the present policy environment; Scenario 2 reflects policy changes designed to speed the movement to a bimodal size distribution of farms; Scenario 3 results from policies designed to slow the concurrent trend toward larger sized commercial farms.

Farm size distribution projections under the three policy scenarios, were developed at Texas A & M University, based (in the case of Scenario 1) on Markov Chain estimates of the transitional probabilities of the shifts in farm size distributions over recent years (OTA, 1985a). Data from the **Agricultural Censuses** between 1969 and 1982 were used in generating the estimates. Projections were made to the year 2000 (under Scenario 1) based on historical trends in farm size distributions for total U.S. farms and for the following commodity groups: dairy, poultry, cattle, grain, hog, and cotton farms. In forming the projections under Scenarios 2 and 3, assumptions were made for the U.S. as a whole regarding the possible outcomes of two sets of policies: (1) policies to speed the movement to a bimodal size distribution (Scenario 2), and, (2) policies designed to slow the trend to larger sized farms (Scenario 3). There is no explicit linkage implied between any specific policy or technology change and its estimated impact on future farm structure. Although the farm structural distributions assumed in Scenarios 2 and 3 are largely arbitrary, they can prove helpful in considering the impacts of technological and policy changes on farm distribution.

Regional projections for the future distribution of total farms in the Northeast were derived from the national estimates as follows. The relevant commodity sector projections under each scenario were weighted by their respective proportions of regional farm numbers in 1982 (using **Census** data) to arrive at region-wide estimates. For the Northeast, due to the absence of cotton farms and the lack of sufficiently disaggregated Census data on hog farms, the relevant commodity sectors and their respective weights were as follows: dairy (.263); poultry (.026); cattle (.132); and grain farms (.091); all other farm types were assumed to be distributed according to the overall distribution pattern for total U.S.

farms, with a weight of .488. The resulting regional size distribution projections are given along with national estimates in Table 28. The regional distributions, though derived from fairly arbitrary assumptions regarding national farm distributions, do yield some insights into possible regional structural changes and how those changes compare to national ones.

Before turning to the implications of these projections, it is important to reiterate that **Agricultural Census** data show that as recently as 1982, the distribution of farms (by sales category) existing in the Northeast was remarkably similar to that existing nationally (see Table 1). Small farms (less than $20,000 sales annually) accounted for 59.4 percent of farms in the Northeast and 60.6 percent in the U.S.; part-time and small commercial farms ($20,000- $99,999 in sales) accounted for 25.8 percent of farms regionally and 26.0 percent nationally; moderate-to-large commercial farms ($100,000-$499,999 in sales) represented 11.2 percent of farms in the Northeast and 9.6 of farms in the nation; and very large commercial farms (greater than $500,000 in annual sales) represented 3.6 of farms in the region and 3.9 percent of farms in the U.S. Measured other ways, by average farm acreage, for example, Northeastern farms differ from representative U.S. farms in many respects (see above discussion). Nonetheless, the similarities in farm distributions measured by value of sales are striking.

Against this background, the regional and national estimates presented in Table 28 can be evaluated in several different ways. First, it must be noted that under all three scenarios, including the continuation of present policies (Scenario 1), Northeastern farms would be distributed more equally across the four farm size categories in the year 2000 than at present. Even under what might be considered the most interventionist set of policies, Scenario 3, farms of greater than $100,000 in sales would account for 21.7 percent of farms in the Northeast versus 14.8 percent in 1982. Under the other two scenarios the trend would be even more marked. Further, under all three scenarios, small farms decline as a proportion of total farms from the level of 59.4 percent in 1982. These conclusions are, of course, based on the assumption that farm size distributions in specific commodity sectors will be the same in the Northeast as in the nation. Given these assumptions, the conclusions suggest that the national trend toward a larger farm size will likely apply to the Northeast under most realistic policy scenarios. However, the trend toward a bimodal farm distribution may be somewhat less appropriate to the Northeast which is projected to experience a more equitable distribution of farms of different sizes than elsewhere.

The second principal conclusion that can be derived from Table 28 is that regardless of the nature of possible policy changes, there will be relatively more larger farms and fewer smaller farms in the Northeast in the year 2000 relative to the nation as a whole. Each of the two categories of larger sized farms will include a greater proportion of total farms regionally than nationally. Conversely, each of the two smaller sized categories will include a smaller proportion of farms in the Northeast than in the U.S. overall. Measured simply in terms of farm numbers, the estimates do not suggest a uniform trend toward larger sized farms in the Northeast; in the region, as in the nation as a whole, farms generating less than $100,000 in annual sales still account for between 73.1 percent

Table 28. Size Distribution of Total Farms in the Northeast and U.S. in Year 2000: Three Scenarios*

Dollar Sales Category (Annual)	Size Distribution					
	Scenario 1		Scenario 2		Scenario 3	
	N.E.	U.S.	N.E.	U.S.	N.E.	U.S.
($1,000)			(percent)			
>$500	6.7	3.6	16.8	11.6	4.9	2.7
100-499	20.2	16.0	10.1	8.0	16.8	12.9
20-99	26.9	29.1	20.1	21.8	32.1	33.1
<20	46.2	51.3	53.0	58.6	46.2	51.3

* Scenario 1: continuation of current policies
Scenario 2: policies implemented to speed move to bimodal size distribution
Scenario 3: policies implemented to slow trend to larger farm size.

Derived from OTA "Information on Size Distribution of Farms."

and 78.3 percent of farms under Scenarios 1-3. Nevertheless, as mentioned previously, in terms of commercial farm operations, it is difficult to see what would interfere with the trend toward larger size and scale of operation (except perhaps under an extreme version of Scenario 3). Again, the trends suggest a somewhat more equal distribution of farms across the various size categories regionally than nationally.

The third important trend that can be observed from the estimates in Table 28 is that, as for the nation as a whole, farm structural changes in the Northeast would appear to be relatively insensitive to policy changes designed to slow the trend to larger farm size (Scenario 3), but relatively more sensitive to policies designed to speed the move to a bimodal size distribution. Table 29 gives the changes in the proportion of farms in each size category resulting from changes in current policies to those assumed under Scenarios 2 and 3. The overall trends evidenced in these data are, of course, wholly dependent on the underlying national distribution assumptions mentioned previously. Given these assumptions, it is clear that in Scenario 2, the Northeast is slightly more responsive with regard to the impacts of policy changes among very large farms, but slightly less responsive to increases in numbers of small farms than in the U.S. in general (Table 29). The regional impacts of Scenario 3 policies are slightly greater than in the U.S. in general, in that the proportion of large farms decreases to a greater extent in the Northeast than nationally as a result of policy changes designed to slow the trend toward larger farm size.

The major factor accounting for the regional differences in policy impacts relative to the U.S. generally is the predominant role played by dairy farms and dairy farming in the Northeast. In 1982, as mentioned before, dairy cash receipts amounted to 44 percent of total farm cash receipts in the Northeast versus 12.4 percent nationally, and dairy farms represented over 26 percent of regional farm numbers. In addition, under all three policy scenarios, dairy farms are (by estimation or assumption) more evenly distributed across different size categories than are farms producing other commodities (with the possible exception of hog farms) and than U.S. farms overall. For these reasons, the regional size distribution patterns given in Table 28 are thus more evenly distributed for the Northeast than for the U.S. as a whole.

What is in the nature of dairy farming that this sector should be relatively more evenly distributed over the entire range of size categories than other enterprises? Several factors may be hypothesized to account for this result. First, the non-industrial "family farm" nature of dairy farming is important. The dairy enterprise is relatively labor-intensive suggesting that, to date, the scale economies resulting from increased capitalization have been relatively less significant in dairy farming than in other types of enterprises. Second, dairying has traditionally involved a high proportion of family-provided labor which has tended to limit the size of the dairy enterprise. In addition, the limited profitability of forage-based dairy farming compared to alternative investments outside of agriculture has precluded the growth of "industrial dairying" in the Northeast. Finally, dairy policy and the regional structure and organization of the dairy industry, in particular institutions such as price supports, marketing orders, and cooperative handling and processing, may have helped

Table 29. Changes in Size Distribution of Farms in Northeast and U.S. in Response to Policy Changes*

Dollar Sales Category (Annual)	Changes in Size Distribution			
	Scenario 1 to 2		Scenario 1 to 3	
	N.E.	U.S.	N.E.	U.S.
($1,000)	(percent change from Scenario 1)			
>$500	+10.1	+8.0	-1.8	-.9
100-499	-10.1	-8.0	-3.4	-3.1
20-99	-6.8	-7.3	+5.2	+4.0
<20	+6.8	+7.3	0	0

* Scenario 1: continuation of current policies
Scenario 2: policies implemented to speed move to bimodal size distribution
Scenario 3: policies implemented to slow trend to larger farm size.

Derived from OTA "Information on Size Distribution of Farms."

keep the small dairy enterprise profitable and viable, relative to small-sized operations in other industries.

Whatever the specific reasons, the importance of the dairy industry in the Northeast creates both advantages and disadvantages for public policy. On the positive side, the projections described above suggest that, despite the trend toward increasing size of operation, the Northeast will continue to be characterized be a highly diversified farm sector in terms of farm size. The diversity of farm types and sizes (which in reality extends to farms other than dairy, as well) represents a diversity of opportunities for young farmers for whom entry may at least be possible. Other favorable impacts could also be cited. Although the Northeast will likely follow to some extent, the national trend toward a bimodal farm distribution, the moderate size of Northeastern farms and the specific commodities produced, in particular dairy, would suggest that the effects of the national trend will be perhaps less adverse in the Northeast than in some other regions.

On the other hand, the high degree of dependence of Northeast agriculture on the health and viability of the dairy industry means that the region has much at stake with regard to future changes in policy and technology relevant to the dairy industry. In this connection, two likely future developments appear of particular importance: possible changes in national dairy policy and commercialization and use of the bovine growth hormone (and other technologies). In the policy area, movement toward a more market-oriented system would have an as yet indeterminant impact on the Northeast dairy industry. One common view is that given reasonable land and labor costs, the availability of forage and proximity to large markets, the Northeast dairy sector would likely fare well relative to competing regions. Even under these circumstances, however, dairy prices received by farmers almost certainly fall in a more "free market" environment, with potentially serious implications for the survivability of dairy farms of all types, but especially small to moderate-sized farms, in the region (OTA, 1985b). The exit of the most inefficient operators in the industry would be inevitable. The impacts on the broader agricultural industry and on specific rural communities could be substantial.

The potential impact of bGH adoption on the Northeastern dairy industry probably will probably have more serious long run consequences. As discussed previously, when bGH reaches the commercialization stage, its adoption is likely to be rapid, especially among larger farms, and fairly complete among farms of all sizes within a relatively short period of time. Given the inelastic demand faced by dairy products, a steady continuation of genetic improvements which will also be yield-enhancing, and the promise of other technological breakthroughs (such as information and UF and RO technologies), there is the potential for a much more serious production overcapacity problem than has been experienced even to date. Given the scale bias of some of these developments, the potential for serious dislocation and structural change in the dairy industry, much greater than that experienced historically, is clearly present. Yet, as discussed below, other factors suggest that the potential adverse effects of farm technology and structure changes may be moderated by a set of circumstances particularly relevant to the Northeast.

B. Public Policy Scenarios

In considering alternative public policies which could be instituted to address the problems arising from the technology and farm structure developments discussed above, two questions are central: (1) In the Northeast, are the prospective effects of these technology and farm structure changes on rural communities sufficiently large and adverse in nature that they warrant the introduction of public policies designed to stop, slow or deal with these changes?; and (2) If #1 is answered in the affirmative, then what types of policies might be most effective in mitigating the effects of these changes, in view of existing political, economic and social constraints and anticipated changes in farm technology and structure?

Justification for Policy Interventions

With regard to the first question, most of the evidence presented in this report would support the view that, based on past developments, the rural community impacts of future farm technology and structure changes are likely to be less important in the Northeast than in other regions of the U.S. As reviewed above, there are a number of factors that support this conclusion.

First, the dairy industry, the dominant sector in Northeast agriculture, and national dairy policy have afforded a stabilizing presence to agriculture and thus the rural sector of the region. Characterized by relatively small and widely dispersed farms, labor intensive operations, "non-industrial" ownership and management, and a variety of traditional institutions (price supports, marketing orders, dairy cooperatives, etc.), the dairy industry has undergone less structural change in recent years than many other agricultural industries. While a number of factors suggest that change will accelerate in the future, the dairy industry in the Northeast will not likely be characterized by the industrial type of agriculture present in some other regions of the U.S. which has figured so prominently in agricultural change in recent decades.

Second, Northeastern agriculture is diverse and involves much more than just dairy farming. A number of other sectors, in particular, poultry and fruits and vegetables, are also important. In a number of these industries, technological and structural change have been important in the past, but, in the future, farm policy changes are likely to be less important than in dairy, and consumer demand is likely to be more dynamic (except for eggs) than for dairy products. The diversity of the region's agriculture will likely prove to be a stabilizing influence in view of anticipated changes in specific sectors (e.g., dairy).

Third, the Northeast will continue to have an important small and part-time farm sector in future years which will remain an integral part of the agricultural industry. Although most of these farms will not be classified as commercial farming operations, the combination of proximity to urban areas and markets, the existence of off-farm job opportunities and the accommodation of changes in lifestyles will guarantee their continued survival, and in many cases, growth. The urbanized nature of much of the

Northeast will assure a continued market for the production of these farms, such as through direct marketing operations.

Finally, because much of the Northeastern region does have a strong urban-industrial influence, if dislocation and structural change do adversely affect the dairy industry or other farm sectors, the impacts on rural economies and communities should in most cases be less severe than they would be in other regions. The existence of off-farm job opportunities and the diverse nature of many local rural economies will minimize the impacts of these changes on employment levels, rural population, and income distribution in most areas. And the development pressure on farmland throughout much of the Northeast, though generally criticized by the agricultural community, will mitigate potential slippages in land values.

These factors suggest that, in general, the adverse consequences of technological and farm structure changes on rural communities in the Northeast will likely be, in general, moderate and less serious compared to other regions of the U.S. This is not to say, however, that these changes will have no adverse impact nor that in some specific instances, that these impacts may be profound. In fact, at least three reasons can be cited as cause for concern and as possible justifications for public policy intervention.

First, there is no question that certain subregional "pockets" of the Northeast with a high dependence on agriculture may be negatively effected by technological and farm structure changes. In these subregions (parts of northern New England; New York's "North Country", etc.), technology and structure changes which, through shifting competitive forces, result in reduced farm output would have negative implications for income and employment generation in agriculture and food processing, the viability of farm input and service industries, and the overall vitality of the rural communities affected. Changes which result in reduced farm numbers but no reduction in aggregate output would have less adverse consequences for input and processing industries, although the rural infrastructure and community impacts could still be severe. In any case, it is clear that the socio-economic well-being of these subregions could suffer especially adverse impacts due to their dependence on agriculture.

Second, as mentioned previously, the likelihood of unprecedented technological change in the Northeast's most important agricultural sector, dairying, raises the possibility of important structural changes in Northeast agriculture which are also without precedent. The region's dependence on dairying, while responsible for stability in the past, may cause serious problems in the future as farmers are forced to deal not only with the consequences of technological change (especially the introduction of bGH), but also the current surplus production problem and likely changes in national dairy price policy.

Finally, it is useful to remember that consequences of change in agriculture go far beyond the farm production sector. The farm sector is only one part of the food system which generates employment, income and value-added in farm input industries, food processing, wholesaling and retailing, and which, of course, is an important part of the rural community infrastructure. Major changes in the farm sector when transmitted through the

entire local economy may be more severe than would be indicated simply by looking at technology and structure impacts in farming only.

Policy Scenarios

The factors provide several justifications for the importance of analyzing policy alternatives which would address the concerns mentioned above. At least four specific types of policy initiatives must be addressed as they relate to technology and farm structure changes and rural communities, and the consequences of each briefly examined. These are: (1) farm commodity policy; (2) macroeconomic policy; (3) a set of regulatory, research, and related policies; and (4) rural development policy.

Commodity Policy

One of the major tools that has traditionally been in the hands of agricultural policymakers has been farm commodity policy. Of the major farm programs, clearly the one with greatest importance to the Northeast is national dairy policy. While dairy policy has been criticized on a number of grounds (see Babb, for example), one criticism that is particularly relevant here is the fact that like most other farm programs, program benefits occur in direct proportion to volume of milk produced regardless of "need". Thus, existing policies simply tend to reinforce the structural impacts of technological changes which favor larger producers at the expense of smaller or medium-sized ones.

If, on the other hand, national dairy policy becomes more "market-oriented", as many feel is inevitable, there will likely be increased pressure on dairy producers of all sizes, but particularly on small and moderate-sized dairy farms. Larger operations will likely continue to benefit relatively more from the adoption of emerging technologies, scale economies in production, and pecuniary economies in input purchasing and product marketing. Farms of all sizes, but especially small and intermediate-sized farms and those with unfavorable equity positions, will face an even tighter cost-price "squeeze", as prices fall closer to market-clearing levels and costs stabilize or rise due to inflation and/or the lack of scale economies enjoyed by smaller producers. In the aggregate, the interregional competitive impacts of changes in both technology and public policy are unknown, but with competitive production cost levels, adequate land, forage, and water resources, increased regional production of animal feeds, and a large and close market guaranteed for dairy products, it is likely that the Northeastern dairy industry will remain competitive with other major production regions. Those rural communities which are likely to suffer from "market-oriented" policy changes are likely to be those which are surrounded by large numbers of marginal farming operations and where the alternative uses of land, capital labor inputs are limited.

The other principal farm commodity programs are designed for products which are generally of relatively little or no importance in the Northeast, and so for the other major regionally-produced farm products, agricultural commodity policy changes are unlikely to have serious impacts. As a net importer of feed from surplus-producing regions, the Northeast is a beneficiary of feed grain programs to the extent that these programs raise feed

production above levels which would prevail in a competitive market. A significant reduction in feed availability induced by policy changes could have negative repercussions for the competitiveness of the Northeast's animal production industries (dairy and poultry, primarily).

Could further changes in farm commodity policies alleviate the problems identified above as occurring as a result of farm technology and structure changes? Certainly, increases in dairy price supports and other measures could help moderate some of the adverse effects of these changes on specific farms, regions, and rural communities. Yet, this is clearly not the direction that farm policy is currently headed and indeed, most observers agree that a greater market-orientation to dairy policy is inevitable.

Furthermore, most of the evidence presented here and elsewhere suggests that farm policy changes are not likely to be very effective in addressing the problems identified above. As explained with regard to Table 28, farm structural changes (and presumably related community impacts) appear to be relatively insensitive to policy changes designed to slow the trend to larger farm size. Policy changes such as movement from a price support system to a direct payments scheme for dairy, decreasing per unit benefits with increases in production, placing a cap on program benefits, or basing support prices on a formula which would reflect changes in milk production costs in a more timely fashion (Babb, 1984), etc., might prove useful in more accurately targeting program benefits for those who are most in need of them. However, for an array of political and economic reasons, such changes would likely prove to be a temporary and inefficient way to solve the problems associated with farm technological and structural change.

One important reason for this conclusion is that farm commodity programs are essentially national in character, while, as has been argued here, the rural community impacts of technology and farm structure change in the Northeast are basically subregional. Development of a federal farm policy structure which is oriented toward regional problems, or the development of statewide agricultural policies might be alternatives to the current situation. However, the former is not likely to be politically viable and the latter, at least as far as commodity programs are concerned, is not likely to be affordable at a meaningful level. State agricultural policies and programs which are instead oriented toward improving the agricultural business environment, providing technical production and marketing assistance to farms and firms, supporting agricultural research and market development (including identifying market "niches" for state-produced products), etc., are more likely to be met with some success. In the Northeast, a number of states, including Maine and New York, are developing state agricultural programs along these lines. By targeting specific products, markets, and regions, individual states may be able to address problems specific to them in a way federal farm programs cannot.

Macroeconomic Policies

Important as farm commodity policy is, a host of macroeconomic-oriented policy changes will likely have an even more dominant - though oftentimes largely invisible - impact on farm structure and rural communities in the Northeast. These policy changes might include changes in

monetary, fiscal, and trade policy, and/or changes in the federal tax system.

Monetary, fiscal and trade policies essentially set the levels of macroeconomic parameters such as inflation, interest rates and exchange rates, on which a farmer's cash flow and net returns are directly or indirectly dependent. While the recent abatement in inflation rates means that prices for farm inputs are holding relatively steady at present, this advantage is, for the farmer, counterbalanced by sagging prices for many farm commodities. In addition, interest rates have not declined in step with inflation leaving real interest rates on both operating loans and loans for capital investments high, a negative development for all farmers, particularly those who are highly leveraged.

One of the major policy changes which would have a favorable impact on farms and, in turn, on rural communities would be a change in fiscal policy leading to a reduction in the federal budget deficit, and, in turn, to a reduction in interest rates. The impact of such a change would be at least twofold. The decline in interest rates would ease farmers' interest costs for operating loans and make cost-reducing capital investments more affordable. Secondly, the decline in the value of the dollar vis-a-vis other currencies in the international market would make U.S. farm exports more competitive internationally, increasing export demand and, ultimately, output price levels.

Tax policies also play an important role in determining farm structural changes. These policies, while generally beneficial to farmers through provisions such as interest deductability and capital depreciation and investment tax credits, have served to provide incentives for farm expansion and the entry of industrial corporations and other non-farm entities into farming. Certain types of farm operations have become notorious tax shelters, encouraging investments in farming that would otherwise not be made. While many of these provisions have encouraged the expansion of farm operations (increasing output and lowering market-clearing prices), the availability of tax benefits to small and part-time farmers has also provided incentives for the growth of these operations as well.

A continuation of these macroeconomic policies in their current direction would likely further enhance the competitiveness of larger farms relative to smaller ones. Developments such as major tax reform, including limiting or terminating interest deductability, decreasing the benefits associated with the farm enterprise, etc., would probably increase the barriers to farm expansion thus increasing the relative viability of smaller farm operations. Clearly, though, farmers with unfavorable equity positions would be at a serious competitive disadvantage relative to those who are not highly leveraged. This would be counterbalanced by the reduced incentives for farm expansion. Thus, although the movement to a larger farm size might be slowed, entry into farming would be made considerably more difficult. Entry incentives would also decrease for those nonfarmers largely seeking to shelter income, so that the resources devoted to farming might decline relatively. It is important to note, though, that examining only the partial effects on agriculture of these macroeconomic changes can be misleading because of the many intersectoral shifts of resources which would undoubtedly occur in the event of genuine economy-wide tax reform.

Again, with the exception of a change in macroeconomic policy leading to lower real interest rates and selected changes in tax policy, it is difficult to envisage macroeconomic policies being sufficiently targetable or sector specific to resolve the technology and structure-induced problems discussed previously. Indeed, one commonly called for policy change, the further liberalization of international trade, might adversely affect the Northeast if dairy import quotas were relaxed as part of a trade liberalization policy.

Regulatory, Research and Related Policies

A third set of policy changes connected with regulatory, research and extension, and environmental and related policies would also have impacts on farm structure and rural communities. The impacts of these policies would more likely be industry or commodity-specific rather than general in impact. For example, a continuation of changes in the regulatory structure surrounding freight transportation would almost certainly have impacts on interregional and intraregional flows of feed grains with possible implications for the geographic structure of animal production in the Northeast. Yet, because agricultural freight is such a small part of the rail freight arrived in the Northeast, it is unreasonable to assume that rail freight transportation regulation could be altered with simply agriculture in mind. The problem of branchline abandonment is probably one of greater importance to most rural areas, and that has proved especially difficult to solve. The impending sale of Conrail will likely have implications for rural areas in the Northeast both in terms of shipping costs and levels of service provision. However, it is too early to tell what these impacts will be.

As with regulatory policy, it is equally unlikely that policy changes could be instituted to significantly divert the direction of technological change in agriculture and its secondary effects in the years ahead. Regulating public research is likely to be ineffectual, since two-thirds of U.S. agricultural research and development expenditures are made in the private sector and it is no longer clear that new agricultural technologies are induced entirely by public research. Moreover, many of the new technologies that will be deployed over the next two decades are already in the development stage in private laboratories and the availability of these technologies will not be affected by any public policies which could reasonably be instituted.

One type of policy change which might have an impact, albeit in the long-run, on technological and structural change in agriculture and its consequences for rural communities would be a large scale redirection of information delivery mechanisms (e.g., Cooperative Extension activities, etc.) toward smaller farms and farms in greatest need of enhanced management expertise. By helping increase the management ability of these producers, their ability to compete with better managed, often larger, farms would be enhanced. Operating against this trend, however, is the fact that the current revolution in personal computers, management information systems and new methods of delivery of information to farmers (on line data bases, videotex, etc.) will likely proceed regardless of public sector interventions. Such policies might expedite or help redirect the impacts of information transfer in agriculture but the private sector is likely to

play an increasingly significant role in this area (for example, in software development for farm applications), and a role that is largely outside the purview of public policy.

As with farm policy and macroeconomic policy, changes in regulatory, research and related policies are not likely to effectively or efficiently solve the problems arising from farm technological and structural change and their resultant impacts on rural communities.

Rural Development Policy

The primary adverse consequences of farm technology and structure change in the Northeast, as mentioned previously, are the impacts on selected farms, farm families, small businesses which service the farm sector, food processors, and specific rural communities which are particularly dependent on agriculture. Given the general lack (with some exceptions) of targetability and efficiency of farm commodity policy, macroeconomic policy, and regulatory, research, and related policies in providing specific solutions to these problems, it is appropriate to ask if **directly** addressing the problems of employment creation, income enhancement, rural infrastructure development, etc., might not be the most constructive policy approach.

There are several important reasons why a comprehensive rural development policy approach directed toward these goals might be constructive. First, there is evidence that from the late 1960s to the end of the 1970s aspects of such a program in fact worked. Prior to the 1960s there were major regional disparities, with rural/nonmetro places and counties exhibiting lower incomes and access to services than their urban/metro counterparts. But beginning in the late 1960s and continuing through the 1970s, there emerged a distinct pattern of convergence in the socioeconomic characteristics of metro and nonmetro counties. While many factors were no doubt involved in this pattern of convergence, there is agreement that the deepening of the social welfare apparatus--transfer payments, service subsidies, extension of protective labor legislation, regional commission economic development programs, revenue sharing, small business loan programs, and so forth--played a major role.

Second, a comprehensive rural development program would be fair; it would benefit the nonmetro counties and communities of the U.S. in a relatively equal manner, regardless of their dependence or lack of dependence on agriculture. Third, there has long been hard evidence that many Americans would prefer to live in small places (rather than metropolitan places) if they had the opportunity; thus a program of this sort could be justified on the grounds that it would provide residential (and, indirectly, employment) options that are of interest to a large proportion of the U.S. population. Fourth, such a policy would have the greatest likelihood of effectively meliorating the adverse changes in farm technology and structure, since it would enhance the ability of those displaced in this process to find alternative employment in their community or region of residence. The existence of additional employment opportunities is, after all, probably the major challenge for public policy in dealing with these technology and structure-induced changes. Finally, one might add that a sustained program of rural development would likely cost less than farm commodity

programs currently do and that it could provide the long-term institution-building that would help to insulate rural places from adverse farm technology and structure changes that extend into the next century.

What specific policy alternatives might be part of a comprehensive rural development policy? Clearly, the key components would be mechanisms for job creation. While the rate of job creation is primarily dependent on the growth of the overall economy, decades of experience have shown that some regions, states and subregions (urban as well as rural) lag behind other regions and the general economy in experiencing economic growth. Thus, targeting policies and programs aimed at job creation toward these regions is one of the primary tools of public policy.

Reinitiating or strengthening (rather than weakening) past and present programs including regional economic development programs, revenue sharing, business development assistance, small business loan programs, etc., are obvious alternatives. In the past, the growth of the rural manufacturing sector was seen as a major source of job creation and economic expansion. While "high technology" and other industries may offer some promise for selected regions in this regard, increasingly, it is service industries which have become the primary instrument for job creation in rural as well as urban areas (Bradshaw and Blakely, 1983). In either case, instituting new programs would, in general, likely be less effective than strengthening the commitment to those which currently exist and are underfunded, or those programs which have worked in the past but which have been eliminated (see Hardy for a detailed discussion of recent federal involvement in rural economic development programs). Recent proposals for the creation of "enterprise zones" to stimulate local economic development may be appropriate in certain selected areas, but outside of these relatively few areas, the problems of rural economic development would remain unaddressed.

At the state level, other options are possible. The State of New York is currently considering the creation of a Rural Development Authority, along the lines of similar organizations which have stressed economic development in urban areas. Such an Authority might be able to stimulate rural economic development through helping identify emerging opportunities for rural business development, helping provide technical and/or management expertise to rural businesses, guaranteeing loans to new rural enterprises, etc. In addition, because of the closer match between regional or sub-regional needs and state compared to federal organizations, such an organization might be effective in identifying specific regional problems and working with rural firms and policymakers. At the same time, however, many of the problems of specific rural areas are attributable to regional and national developments and thus statewide solutions to these problems are often of limited potential effectiveness.

Beyond job development, other aspects of a rural development policy would include assistance to local governments and rural infrastructure development. For a variety of reasons, rural communities typically have a lower capacity for effective collective action than many urban areas (Wilkinson et al., 1983). Providing technical and management assistance to local governments and local government officials is one mechanism for strengthening the ability of rural communities to manage and allocate their resources effectively.

Rural infrastructure development is another important aspect of rural development policy and one in which federal government has had an important traditional role. The attractiveness of rural life is mitigated for many by the perception (often well-deserved) that rural areas are often characterized by poor roads, bridges and other physical infrastructural elements leading to difficulties in transportation and communication, a level of services that is lacking compared to urban and suburban areas, poor housing and other deficiencies. In recognition of these problems and the particularly serious impacts they can have on a widely dispersed population, a number of state governments (including New York) have recently given more attention and public funding to investment in the rural infrastructure. Federal involvement has recently been mixed, increasing in some areas, but drastically decreasing in other areas of particular concern to rural areas, rural housing, in particular (Hardy, 1983). While the quality of the rural physical infrastructure is important, the quality of the socioeconomic infrastructure of rural areas is equally critical in meeting rural needs. Thus, the abovementioned elements of a rural economic development policy are again especially important.

APPENDIX A

HISTORICAL PERSPECTIVES ON AGRICULTURE AND THE RURAL COMMUNITY

Settlement Patterns and Forms of Agrarian Organization in the Seventeenth and Eighteenth Centuries

The Northeast Region, although it encompasses only about 6 percent of the total U.S. land surface (Schertz, 1979:259), was settled over an extended, two-century-long period from roughly 1630-1830. The brief analysis that follows can hardly do justice to the changing conditions and nature of settlement over such a long period of time. Nevertheless, it is useful to consider the formative period of settlement and agrarian organization in the Northeast colonies, since the patterns that emerged at that early stage have had lasting impacts on farm and rural community structure up to the current era.

During the first century of settlement in the Northeast, there were two major forms of settlement patterns: the village settlement and the dispersed farmstead (isolated farmstead, or open country) patterns. The village settlement pattern involved the clustering of homes of farmers to form a village or hamlet, leaving the pastures, fields, and forest lands in the surrounding areas devoid of dwellings. Barns and other farm buildings were generally clustered toward the village core as well. The dispersed farmstead pattern, by contrast, involved farm dwellings and other buildings being located on the farming plot. Hence, farm residences would tend to be relatively isolated or scattered from one another. With regard to the village form of settlement, there was, in a sense, a clear unity of farm and community structure: The agricultural community consisted in large part of the farm families who had their residences and other buildings at the community core. The allotments of land made to settlers, in fact, tended not to be individually fenced, but rather the entire village community--both the village core and the outlying lands--was surrounded by a common fence. With regard to the dispersed farmstead system, settlers typically did not enjoy the presence of a hamlet or trade center; several years--often even a decade or more--would pass before there would appear a population concentration such as a hamlet (MacLeisch and Young, 1942:11).

Both the village and dispersed farmstead forms of settlement during the first century of colonization involved manorial (or estate) and nonmanorial subtypes. One of the major mechanisms of distributing land in the colonies was for the King of England to make large grants of land to his friends or supporters. Proprietors of these land grants were expected to colonize the land. The King, for example, made land grants to Lord Baltimore to found the colony of Maryland and to William Penn to found the colony of Pennsylvania. Many such proprietors receiving land grants attempted to create manorial estates with a system of hereditary nobles and peasants. These attempts were most common in Maryland and the Carolinas. Most attempts to establish manorial forms of agricultural organization involved transplanting the English village system to the colonies. There were, however, Dutch-colonial analogues of the manorial system that emerged in areas, such as the Hudson and Mohawk Valleys of New York State, where there was extensive land speculation and a general absence of the village settlement pattern (Ebling, 1979:25). Here the Rensselaers, Livingstons, Schuylers, and other families became aristocratic landlords who lived off the labors of their many tenants (Gates, 1960:36). The manorial-patroon system established by the Dutch in New York State was largely adopted by

the British after Holland conceded the colony to England in 1664. This system would remain largely intact until the Revolutionary War, and remnants would persist until the mid-nineteenth century (Herman, 1979:38-49).

Attempts to establish manorial or semi-servile forms of agricultural organization, based either on village or dispersed farmstead settlement patterns, tended to be short-lived. To be sure, landlordism and tenancy were still flourishing in parts of New York State and Pennsylvania well into the late 1840s. Yet the general abundance of land tended to undermine manorial schemes. Would-be feudal lords in Maryland and elsewhere for obvious reasons found themselves unable to attract settlers, and many were forced to distribute their lands as gifts or sell land for nominal prices in order to encourage settlement.

In New England, virtually all the early settlements took the village form. These village settlements were very similar to English villages. Village settlements spread throughout most of Southern New England and, to some degree, into New York, New Jersey, and Pennsylvania. Until 1725, when the village system was experiencing a demise, land speculation was essentially unknown, and there tended to be a relatively small degree of social class inequality among farmers (Main, 1965). As the village system evolved, however, population growth in conjunction with destructive farming techniques tended to result in increasing landlessness, land fragmentation, and conflicts within the corporate group over taxation, property qualifications for voting, and the responsibility of the wealthy toward the poor. Outlying sections of the village typically sought to separate from the village, while the village centers resisted these demands (Lockridge, 1970:Chapter 3). Increasingly after 1750 the propertyless, poor, and the young and strong from Southern New England village groups began to look north and west for land to settle. Socioeconomic conditions in Southern New England--particularly Massachusetts--deteriorated even further after the Revolutionary War. State and local debts were high, leading to heavy and inequitable taxation. Land was becoming crowded, expensive, and worn out. The Massachusetts ruling class and the Congregational Church were felt to be unfair to the poor. Migration from Southern New England toward Northern New England and the western areas accelerated after the War.

New settlements after the early 1700s were largely of the dispersed farmstead type. The settlement of Northern New England, which began around 1765 and accelerated after the Revolutionary War, was virtually all of the dispersed farmstead type. In New York, where the original settlers were Dutch, the Dutch authorities placed considerable pressure on settlers to adopt the village form (Herman, 1979:38). These efforts were successful only to a minor degree, and the bulk of the state was settled with dispersed farmsteads. The dispersed farmstead settlement pattern that was to prevail in New York has generally been credited with diffusing the scattered-farmsteads form of settlement westward (Smith, 1970:123; Gates, 1960:Chapter 2). The colony of Pennsylvania had both village and dispersed farmstead settlement patterns from the beginning; most of the colony, however, was settled in the dispersed-farmsteads pattern, especially after the Revolutionary War.

There were a number of reasons why the village pattern of settlement, which was nearly universal at the outset of colonization, would ultimately

yield to the isolated farmstead and complementary trade center pattern. First, the dispersed homestead form was most compatible with livestock production. Second, as responsibility for the dispersal of land shifted from a governmental to a proprietorial basis, there was less control over settlers' location of housing and other buildings, especially since settlers attempted to choose plots that had the highest quality land. Third, squatting became relatively prevalent on lands in Northern New England and the West, and the only means by which a squatter could hope to hold the land which he occupied extralegally was to establish himself and family directly on the farm. Fourth, the rapidly deteriorating socioeconomic conditions of the village settlements in Southern New England no doubt motivated settlers to avoid the organizational conditions that might lead to tyranny and inequality in their new regions of residence. Nevertheless, by 1800 the isolated farmstead and complementary trade center had become the predominant pattern of agricultural and rural community organization in the North.

The agricultural structures of the Northern colonies (and, after the Revolutionary War, the "Northern" states) generally involved relatively egalitarian landholding systems. At the time of the Revolutionary War, most farming communities were largely self-sufficient; relatively little wealth was accumulated, and accordingly there were few farmers of great wealth (Main, 1965). Relative equality of landholdings was generally the case in the frontier areas, especially outside of the parts of New York and western Pennsylvania where land speculation was prevalent.

There were two major exceptions to the pattern of relative equality of landholdings. The first exception was that of communities, generally in Southern New England or New Jersey proximite to cities or navigable rivers, where agriculture had become commercialized by the time of the Revolutionary War (Main, 1965:Chapter 1; Lockridge, 1970:Chapter 8). These farming areas, which produced foodstuffs for the growing urban populations, exhibited high degrees of concentration of land and income. It was typical, for example, in commercial farming areas of Massachusetts in the mid-eighteenth century for 50 percent of the income to be accounted for by the most affluent 10 percent of the population (Lockridge, 1970:142). Main (1965:28ff.) in his study of the class structure of America at the time of the Revolutionary War found that commercial farm communities tended, by comparison with subsistence communities, to have greater land concentration, relatively few small farmers, a larger proportion of propertyless laborers, and a larger proportion of artisans and professional men.

The second exception to the pattern of relative equality of landholdings in the Northern States was, as noted earlier, certain regions of New York, Pennsylvania, and New Jersey where land was originally controlled by "landed aristocrats" (Main, 1965:17), as in the Hudson and Mohawk Valleys of New York and portions of New Jersey, or where there was extensive land speculation, as in Western Pennsylvania and parts of Central and Western New York (Gates, 1960:Chapter 2). In the last decade of the eighteenth century, for example, one man in Penn Yan, New York, owned 25,000 acres that were rented to tenants (Gates, 1960:31), and eighteen individuals and partnerships held 4.2 million acres in Western Pennsylvania in the early 1930s (Gates, 1960:41).

Despite these staggering instances of land concentration in the Western frontier, there were strong tendencies as the nineteenth century unfolded for large landholdings and landlordism to disappear. In New York, Tory landholdings were confiscated after the Revolutionary War and sold to speculators and smallholders (Herman, 1979:47). Freeholding was given an additional post-Revolutionary-War boost when the state of New York granted large areas in central New York as homesteads to soldiers who served in the militia (Hedrick, 1933:63; Herman, 1979). Further, if tenant-settlers had no hope of obtaining ownership of their lands, they would be able to sell out or abandon their possessions and move west to new frontier areas. Landlords thus came to have to deal leniently with their tenants, lest they risk the wholesale abandonment of their properties by disgruntled tenants. Large landholdings also tended to be liquidated over time as a result of tax burdens, slow returns from marginal lands, and the availability of non-farm investment outlets. Other estates were divided upon inheritance or through foreclosure (Gates, 1960:Chapter 2). Monopolistic landlordism in New York was dealt its final blow by the Anti-Rent Movement in the 1830s through the 1850s, which carried out violent resistance against landlord-patroons during the early years and which would later elect Anti-Rent candidates to local and state offices (Herman, 1979:48, Hedrick, 1933:57-61).

Farm Structure and Rural Communities in the Nineteenth Century

Although many frontier areas tended to exhibit self-sufficient, subsistence agriculture, by the end of the second decade of the nineteenth century agriculture in the Northeast had become strongly commercial (Gates, 1960:Chapter 19). Commercialization was stimulated at the farm level by indebtedness and taxation and at the macro level by urbanization, industrialization, and transportation infrastructural development--especially steamboat- and canal-based commerce in the 1820s and 1830s and extensive railroad development from 1830-1860 (Cochrane, 1979:Chapter 11). Commercialization, however, was a mixed blessing for many farmers in the Northeast. On one hand, urban-market-led commercialization enabled many farmers to service their debts and avoid foreclosure, but Northeast agriculture generally fared poorly in the competition with Western farmers that was opened up by post-1830 transportation improvements.

The history of Northeastern agriculture during the nineteenth century was one of slow decline and relatively rapid adjustment. Numbers of farms and farmers in Southern New England began to level off and decline after the turn of the century. Farm numbers in Northern New England reached their apogee from 1840 to 1880, and farm numbers in the Middle Atlantic states were at their peak during the 1880s (Fitchen, 1981:Chapter 3; Edwards, 1940; Shannon, 1945:Chapter 11). Farm numbers in the region as a whole began a steady decline after 1880 (Tostlebe, 1957:50).

Agricultural decline in the Northeast was caused by several factors. First, and most important, was the deepening of commercial agriculture on an interregional basis, which subjected Northeastern farmers to the competition of their counterparts in Ohio, Indiana, and, later, the western prairie states (Edwards, 1940:204-5). At the same time, Northeastern farmers' competitive position was weakened by their general tendency to use primitive technologies--what Edwards (1940:205) referred to as being essentially "medieval" practices--which, in conjunction with land resources that

were generally inferior to those of the West, galvanized agricultural decline in the Northeast.

It should be stressed, however, that the agricultural decline of the Northeast was highly uneven and that significant adjustments were made that, by and large, persist up to the present time. As late as 1840, Pennsylvania was America's leading wheat-producing state (Ebling, 1979:78), and Pennsylvania, New York, and New Jersey at that time were the nation's "bread states" (Edwards, 1940:205). There were several other prosperous areas of commercial agriculture in the Northeast at mid-century--especially the Connecticut Valley, the Narragansett country of Rhode Island, and the western counties of Massachusetts. But, in general, Northeastern agriculture from 1840 to the turn of the century underwent a progressive decline because of unfavorable agroecological conditions and western competition. By 1850, there were 7,000 miles of railroad in the country, and flour made from Western wheat was generally used by New England residents, even by farmers (Edwards, 1940:207). From 1840 to 1850, sheep raising in Southern New England declined by nearly 50 percent and by an additional 35 percent from 1850-1860 (Edwards, 1940:207; see also Gates, 1960:Chapter 19; Shannon, 1945:Chapter 11).

Beginning after 1810, the Northeast region, especially Southern New England, began to experience three parallel trends--rapid population growth, urbanization, and industrialization--that would leave a lasting imprint on agriculture and community in the region. From 1810 to 1840, the population of the New England and Middle Atlantic states doubled, with much of this population increase concentrated in urban areas and derived from immigration. "[T]he population of the Eastern States increased from 3,487,000 in [1810] to 6,761,000 in 1840; urban centers of over 8,000 inhabitants increased from 3 in 1790 to 33 in 1840; while in southern New England all but 50 of the 479 townships had at least one manufacturing village clustering around a textile mill, an iron furnace, or some other industry" (Edwards, 1940:206).

These changes in the population morphology of the Northeastern states, in conjunction with Western competition, would have three major impacts on agriculture in the region. First, there developed a substantial home market, which deepened the commercialization of Northeastern agriculture. Second, Northeastern agriculture shifted from general farming to commodity specialization; each subregion after 1810 until 1840 came to concentrate on a small number of commodities for which the agroecological conditions were best suited. These commodities, because of their perishability or bulk, tended to escape Western competition. Third, commercialization and specialization stimulated technological change such as use of the grain cradle, the steel plow, and horse-drawn machinery (Edwards, 1940; Shannon, 1945:Chapter 11).

The Northeast Region thus became progressively more specialized in producing milk, butter, cheese, poultry, vegetables, and fruits for the growing urban markets. Market gardening and dairying developed in the close proximity of major urban areas, especially, New York, Philadelphia, Boston, Providence, and Newport. Production of fluid milk became more prevalent close to cities, while butter and cheese production increased rapidly in upstate New York, especially after completion of the Erie

Canal. Other areas more distant from urban centers became specialized in cattle and sheep production while other areas emphasized producing horses or hay for city and town stables.

The restructuring of Northeastern agriculture to the conditions of western competition and creation of an urban home market was, nonetheless, an uneven process. The tendency toward specialization was earliest and strongest close to major urban centers. Credit was typically scarce, and many farmers found it difficult to secure the financing to alter their farm infrastructure in line with the new market imperatives (Gates, 1960: Chapter 19). Also, as Edwards (1940:207) noted, the impulse toward land speculation tended to cause many farmers with sufficient capital to restructure their enterprises to divert this capital into the purchase of more real estate rather than in new labor-saving machinery. Nonetheless, there was a steady trend across the region toward specialization of commodity production--a process that was substantially completed by 1850 (Cochrane, 1979:Chapter 4).

Equally significant for Northeastern agriculture and Northeastern society as a whole was the emergent articulation between farm and community structure based on backward and forward linkages between agriculture and industry. Virtually all manufacturing industry in the U.S. at mid-century was located in the Northeast. This industry was not, however, concentrated solely in large urban centers. Textile mills, grist mills, and other factories were quite dispersed spatially, as indicated in a previous quote from Edwards (1940). Edwards (1940:207) discussed the relationships between agriculture and community in the Northeast as follows:

> Now that the farmer received a cash income he turned to factories to supply him with the clothes, tools, and furniture he had formerly made for himself. The decline of household industries had as revolutionary an influence on rural life as the growth of industrialization had on the formation of a wage-earning class. As self-sufficient farming waned, long-established habits and traditions in thinking and living were uprooted. The family as an economic unit became less important, with all that implied for rural mores; farmers' sons and daughters began migrating to the mill towns to take up a new way of life. Those who remained behind developed a taste for urban standards of living.

Thus the articulation between agriculture and nonfarm industry, much of it located in relatively rural places, played a major role not only in the restructuring of the Northeastern agriculture, but also in contributing to the industrialization of the region during the nineteenth century (Gates, 1960:Chapter 2).

This articulation between agriculture and industry in the Northeast was, however, on less favorable terms for the former than for the latter. Northeast industry generally prospered during the latter decades of the nineteenth century, while Northeastern agriculture, relative to the other agricultural regions of the U.S., tended to stagnate. The average number of acres per farm in the Northeast region declined from 104 in 1870 to 95 in 1890; it would not be until 1950 that the average number of acres per farm in the Northeast would reach its 1870 level (Tostlebe, 1957:87)!

Similarly, the average level of physical farm assets per farm increased by only 7 percent (in constant prices) from 1870-1900, by comparison with a 104 percent increase for the U.S. as a whole. The Northeast region was the only U.S. region that exhibited a decline in the value of physical farm assets per farm from 1900-1920. For the entirety of the 1870-1920 period, the Northeast exhibited the slowest rate of increase in physical farm assets on the basis of both aggregate and per farm comparisons (Tostlebe, 1957:Chapter 4). Gross farm income in the region increased by only about 30 percent from 1869 to 1899 (in constant prices), while the next-most-stagnant agricultural region--the Appalachian region--exhibited an increase of more than 100 percent during the same time period (Tostlebe, 1957:215). From 1890 to 1900, the Northeast region began to experience an absolute decline in the number of persons engaged in agriculture (Tostlebe, 1957:48), while all other U.S. regions during the decade exhibited increases in the number of persons in agriculture. This decline in the number of persons in agriculture in the Northeast region would continue more or less unabated until the 1970s.

Two further aspects of agricultural change in the Northeast should be noted. First, by the end of the nineteenth century virtually all estate-type holdings--save the Wadsworth holdings in Genesee County, New York--had disappeared (Hedrick, 1933:62-3). By 1880, the Northeast in general and New York in particular had tenancy rates well below the U.S. average (Shannon, 1945:418). Second, beginning during the 1880s there began a trend toward the decline of land in farms that, with the exception of the Depression years, was not stemmed until 1945. From 1880 to 1940, land in farms in the Northeast declined from 68.0 to 47.0 million acres, and improved land from 46.4 to 26.6 million acres (Tostlebe, 1957:50). The bulk of this land reverted to forests.

Concomitant with the agricultural decline of the Northeast at the end of the nineteenth century were the beginnings of rural community dislocations. For example, Fitchen (1981:Chapter 3) in her study of an upstate New York farm community noted that the period from 1870-1920 was one of slow decline of agriculture and shifts in the relationships between farm families and the trade center/hamlet. Most farms were small and combined subsistence and commercial farming. There was a steady turnover of the farm population as farmers left agriculture for jobs in towns, farm children left the farm for education or employment, and new farm operators came in to buy up the hill farms when others left. The farm population, nevertheless, slowly but steadily declined, and the most marginal farmland was abandoned for forest. Farming remained the predominant economic base of the community, but this base was unhealthy. Fitchen noted in her historical research that the increased rate of turnover in the ownership and operation of farms tended to reduce the cohesion of the hamlet community, while the diminishing farm population caused a contraction in the volume and diversity of retail trade. Further, the region as a whole was experiencing growth in large villages and cities, and Fitchen found that farm families and residents of the trade center community began to turn to larger outlying villages and cities for more and more of their retail purchases. Fitchen argues, nonetheless, that the hamlet, though experiencing decline from 1870-1920, remained a viable, active community. But this community ultimately was to experience disintegration in the period from 1920-1950 as the two forces that emerged earlier--agricultural decline and the

rising importance of larger villages and cities--became intensified after World War I. This trend would become quite widespread in the areas of the Northeast that had low-quality agricultural resources and were a long distance from major urban centers.

Structural Change in Northeast Agriculture, 1900-1970

Farm population and number of farms. Tables A-1 and A-2 report data on the size of the farm population and the number of farms, respectively, in the U.S. and the Northeast from 1900-1969. The data in Table 1 on trends in the size of the farm population indicate the distinctiveness of the Northeast region in that the region's farm population began to decline significantly after 1900 and, with the exception of the decade of the Great Depression, declined steadily until 1969. The Northeast's farm population decreased from 3.364 million in 1900 to 0.741 million in 1969, a 78 percent decline, while the U.S. farm population declined by about 58 percent during this same period. Moreover, the U.S. farm population did not begin to decline appreciably until the early 1940s. Table A-1 also indicates that the farm population in the six New England states declined at a more rapid rate than did that of the three Middle Atlantic states. In 1969, roughly 81 percent of the Northeast Region's farm population was in the three Middle Atlantic states.

Data on the number of farms in the Northeast Region and the U.S. from 1900-1969 are given in Table A-2. These data closely parallel those for size of the farm population. Farm numbers in the region began a long-term pattern of decline after 1900, interrupted only by World War II. Farm numbers in the U.S. as a whole did not begin to decline until after 1920, and the rate of decline was quite slow until the post-World War II period. Within the Northeast Region, the rate of decrease in farm numbers was consistently more rapid in the New England states than in the Middle Atlantic states (see Stanton and Plimpton, 1979). The post-war loss of farms in both the U.S. and the Northeast was most pronounced among relatively small farms (Schertz, 1979; Stanton, 1984; Stanton and Plimpton, 1979).

Land in farms. Schertz (1979:259) has argued that "[o]ne of the most striking developments in farming in the Northeast has been the decrease in land used for crops for 100 years." He goes on to note that total acres of cropland in the region peaked around 1880 and declined thereafter. After rising again during the Depression and World War II years to a level of 21 million acres in 1944, the region's cropland acres reached a post-World War II low of 12 million acres in 1969. The rate of decline in cropland acres in the Northeast after World War II was far sharper than in the U.S. as a whole. Moreover, according to Schertz, while the Northeast followed the general national trend in the 1960s toward increases in cropland acres, the increase in cropland in the Northeast began later--in 1969, as opposed to 1962 for the U.S. as a whole--and was relatively smaller--8 percent in the Northeast compared to 13 percent for the U.S. (Schertz, 1979:259-60).

Table A-3 reports data for the Northeast and the U.S. on trends in total land in farms. It should be kept in mind that acres of land in farms and acres of cropland are, of course, closely related but are not identical; not all land in farms is utilized as cropland. In the 1970s in the Northeast, about 60 percent of land in farms was used as cropland, as

Table A-1. Farm Population, 1890-1969, By Division, Region, and State.

Division, region, and State	Farm population (1,000)													
	1969	1964	1959	1954	1950	1945	1940	1935	1930	1925	1920	1910	1900	1890
United States	10,307	12,954	16,592	19,019	23,048	24,426	30,547	32,161	30,529	31,190	31,974	32,077	29,875	24,771
Northeast	741	929	1,178	1,397	1,791	1,906	2,411	2,633	2,287	2,435	2,537	2,901	3,364	3,194
New England	138	183	246	301	403	446	623	718	575	617	633	764	892	878
Maine	33	46	66	86	122	125	176	187	171	190	200	247	267	283
New Hampshire	12	17	23	32	47	51	71	77	63	72	77	102	131	130
Vermont	34	45	60	66	81	75	107	123	113	122	127	142	152	148
Massachusetts	30	39	52	61	80	111	147	165	124	125	120	140	183	167
Rhode Island	4	5	6	8	10	12	17	22	17	16	15	20	28	26
Connecticut	25	30	39	47	63	71	105	144	87	92	94	112	131	123
Middle Atlantic	603	747	929	1,095	1,388	1,460	1,788	1,915	1,712	1,818	1,904	2,137	2,472	2,317
New York	254	321	408	467	578	601	730	789	722	768	806	922	1,113	1,076
New Jersey	50	61	75	85	105	112	143	145	131	138	145	165	176	155
Pennsylvania	300	365	446	543	705	746	915	981	859	912	953	1,050	1,183	1,085
North Central	4,496	5,246	6,191	6,732	7,433	7,767	9,349	9,951	9,583	9,805	10,158	10,714	11,094	9,995
East North Central	2,147	2,519	2,974	3,276	3,703	3,866	4,638	4,808	4,501	4,637	4,953	5,275	5,653	5,144
Ohio	434	515	607	717	853	893	1,089	1,136	1,016	1,060	1,149	1,245	1,354	1,241
Indiana	432	493	569	606	667	696	816	860	815	848	914	997	1,071	998
Illinois	492	565	652	694	763	808	979	1,026	1,002	1,033	1,107	1,219	1,341	1,289
Michigan	324	410	510	590	695	704	871	847	785	807	856	912	982	843
Wisconsin	464	537	636	668	725	765	883	939	883	889	927	902	904	773
West North Central	2,349	2,727	3,217	3,457	3,729	3,901	4,711	5,143	5,082	5,168	5,205	5,440	5,441	4,851
Minnesota	502	572	671	698	740	753	915	934	898	908	903	833	856	641
Iowa	565	645	755	767	783	815	931	974	981	990	991	1,053	1,139	1,047
Missouri	417	515	630	747	863	882	1,125	1,192	1,118	1,172	1,219	1,352	1,475	1,318
North Dakota	161	187	220	235	254	277	328	389	398	397	398	369	239	139
South Dakota	178	201	228	238	254	261	307	360	391	380	364	371	274	240
Nebraska	263	301	349	370	391	417	498	585	587	588	588	631	619	615
Kansas	263	306	364	401	444	495	607	709	709	733	742	830	838	851
South	4,058	5,513	7,613	9,139	11,896	12,740	16,400	17,162	16,364	16,762	17,063	16,657	14,226	10,723
South Atlantic	1,483	2,106	2,984	3,573	4,633	4,891	6,060	6,283	5,914	6,215	6,496	6,212	5,271	4,209
Delaware	16	21	26	29	34	39	46	50	47	49	52	58	50	47
Maryland	84	108	135	150	183	201	246	245	238	261	283	297	254	221
District of Columbia	----	----	----	----	----	----	----	----	----	----	----	1	1	2
Virginia	259	356	502	579	732	831	986	1,066	953	1,020	1,078	1,065	952	748
West Virginia	84	117	165	264	411	445	533	569	450	466	484	544	535	429
North Carolina	507	710	1,006	1,126	1,377	1,360	1,659	1,645	1,604	1,566	1,520	1,409	1,258	998
South Carolina	165	282	465	543	701	709	917	960	919	1,001	1,086	970	835	628
Georgia	251	371	530	697	962	1,052	1,368	1,424	1,423	1,566	1,706	1,594	1,183	950
Florida	117	140	165	186	233	254	305	324	280	286	285	273	203	185
East South Central	1,433	1,933	2,641	3,146	4,048	4,271	5,283	5,409	5,109	5,163	5,257	5,291	4,860	3,833
Kentucky	474	550	652	768	974	1,038	1,261	1,326	1,180	1,249	1,324	1,286	1,267	1,024
Tennessee	412	538	715	818	1,016	1,046	1,276	1,326	1,219	1,249	1,290	1,278	1,246	1,007
Alabama	240	367	553	708	960	1,068	1,343	1,405	1,344	1,343	1,355	1,383	1,166	909
Mississippi	308	477	721	852	1,097	1,119	1,403	1,352	1,366	1,322	1,288	1,344	1,181	892
West South Central	1,141	1,474	1,988	2,420	3,215	3,578	5,057	5,470	5,341	5,384	5,310	5,154	4,095	2,681
Arkansas	245	327	483	595	802	798	1,113	1,198	1,122	1,153	1,165	1,107	956	804
Louisiana	173	240	326	414	567	608	854	872	833	823	798	732	608	431
Oklahoma	219	258	318	404	553	651	930	1,031	1,027	1,045	1,033	1,022	587	44
Texas	503	650	860	1,007	1,292	1,520	2,160	2,369	2,359	2,363	2,314	2,293	1,943	1,401
West	1,011	1,265	1,613	1,751	1,929	2,008	2,387	2,415	2,295	2,188	2,216	1,805	1,192	859
Mountain	471	577	719	780	859	905	1,118	1,199	1,143	1,119	1,179	918	502	312
Montana	94	106	123	128	136	134	176	197	205	209	228	111	67	82
Idaho	107	128	156	159	165	161	203	201	189	189	203	148	81	39
Wyoming	35	41	52	54	57	53	73	76	74	69	68	52	30	18
Colorado	99	122	154	175	198	191	253	278	284	267	268	203	115	97
New Mexico	48	60	76	103	132	149	178	192	159	154	163	184	61	43
Arizona	37	55	73	74	77	101	114	101	99	92	92	85	33	11
Utah	41	53	69	74	81	102	105	139	116	124	141	122	106	66
Nevada	10	11	13	13	13	14	16	15	17	16	16	13	9	7
Pacific	541	689	894	971	1,070	1,102	1,270	1,216	1,152	1,069	1,037	887	690	546
Washington	140	170	216	242	274	304	340	342	306	291	289	260	171	123
Oregon	124	145	176	200	228	233	259	263	224	217	219	210	180	141
California	268	362	502	529	568	565	670	621	622	561	529	417	339	283
Alaska	2	2	----	----	----	----	----	----	----	----	----	----	----	----
Hawaii	7	9	----	----	----	----	----	----	----	----	----	----	----	----

SOURCE: Tables 1-6 are taken from U.S. Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, Bicentennial Part 2 (Washington, D.C.: U.S. Government Office, 1976).

Table A-2. Farm Numbers in the U.S., 1850-1969, By Division, Region, and State.

Division, region, and State	Number of farms (1,000)																	
	1969	1964	1959	1954	1950	1945	1940	1935	1930	1925	1920	1910	1900	1890	1880	1870	1860	1850
United States	2,730	3,158	3,711	4,782	5,388	5,859	6,102	6,812	6,295	6,372	6,454	6,366	5,740	4,565	4,009	2,660	2,944	1,449
Northeast	152	202	255	339	400	498	483	556	483	578	582	657	678	659	696	602	565	490
New England	29	42	57	82	103	150	135	168	125	169	167	187	192	190	207	181	184	168
Maine	8	13	17	23	30	42	39	42	39	50	48	60	59	62	64	60	56	47
New Hampshire	3	5	7	10	13	19	17	18	15	21	21	27	29	29	32	30	31	29
Vermont	7	9	12	16	19	26	24	27	25	26	29	33	33	33	36	34	32	30
Massachusetts	6	8	11	17	22	37	32	35	26	33	32	37	38	34	38	27	36	34
Rhode Island	1	1	1	2	3	4	3	4	3	4	4	5	5	6	6	5	6	5
Connecticut	4	5	8	13	16	22	21	32	17	23	23	27	27	26	31	26	26	22
Middle Atlantic	123	160	198	257	297	347	348	398	358	419	425	468	486	469	489	421	381	322
New York	52	67	82	106	126	149	153	177	160	189	193	216	227	226	241	216	197	171
New Jersey	6	11	16	23	25	26	26	29	25	30	30	33	35	31	34	31	28	24
Pennsylvania	63	83	100	129	147	172	169	191	172	200	202	219	224	212	214	174	156	128
North Central	1,152	1,277	1,461	1,704	1,868	1,986	2,097	2,264	2,079	2,163	2,182	2,233	2,137	1,924	1,698	1,125	772	438
East North Central	513	574	666	799	885	954	1,006	1,084	967	1,052	1,085	1,123	1,136	1,009	985	762	587	368
Ohio	111	120	110	177	199	221	234	255	219	245	257	272	277	251	247	196	180	144
Indiana	101	108	128	154	167	176	185	201	182	196	205	215	222	198	194	161	132	94
Illinois	124	133	155	176	195	204	213	231	214	226	237	252	264	241	256	203	143	76
Michigan	78	94	112	139	156	176	188	197	169	192	196	207	203	172	164	99	62	34
Wisconsin	99	119	131	164	169	178	187	200	182	193	189	177	170	146	134	103	69	20
West North Central	639	704	795	905	983	1,032	1,091	1,180	1,113	1,111	1,097	1,110	1,061	915	713	363	186	69
Minnesota	111	131	140	165	179	189	197	203	185	188	178	156	165	117	92	47	18	(Z)
Iowa	140	154	175	193	203	209	213	222	215	213	213	217	229	202	185	116	61	15
Missouri	137	147	169	202	230	243	256	278	266	260	263	277	286	238	216	148	93	54
North Dakota	46	49	55	62	65	70	74	85	78	76	78	74	45	28	4	[1]2		
South Dakota	46	50	56	63	66	69	72	83	83	80	75	78	53	50	14			
Nebraska	72	80	90	101	107	112	121	134	129	128	124	130	122	114	63	12	3	
Kansas	86	92	104	120	131	141	158	175	166	166	165	178	173	167	139	38	10	
South	1,161	1,373	1,636	2,317	2,652	2,881	3,007	3,422	3,224	3,131	3,207	3,098	2,620	1,836	1,531	886	672	518
South Atlantic	371	468	592	859	959	1,043	1,019	1,147	1,058	1,108	1,159	1,112	962	750	644	374	302	248
Delaware	4	4	6	6	7	9	9	10	10	10	10	11	10	9	9	8	7	6
Maryland	17	21	25	33	36	41	42	44	43	49	48	49	46	41	41	27	25	22
District of Columbia												(Z)	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)
Virginia	65	80	98	136	151	173	175	198	171	194	186	184	168	128	119	74	93	77
West Virginia	23	35	44	69	81	98	99	106	83	90	87	97	93	73	63	40		
North Carolina	119	148	191	268	289	287	278	301	280	283	270	254	225	178	158	94	75	57
South Carolina	40	56	78	124	139	148	138	166	158	173	193	176	155	116	94	52	83	80
Georgia	67	83	106	166	198	226	216	251	256	249	311	291	225	171	139	70	62	52
Florida	36	41	45	58	57	61	62	73	59	59	64	60	41	34	23	10	7	4
East South Central	392	469	533	790	913	960	1,023	1,137	1,062	1,006	1,052	1,042	903	656	570	372	271	223
Kentucky	125	133	151	193	218	239	253	278	246	259	271	259	235	179	166	118	91	75
Tennessee	121	133	158	203	232	234	248	274	246	253	253	246	225	174	166	118	82	73
Alabama	72	93	116	177	212	223	232	273	257	238	258	263	223	158	136	67	55	42
Mississippi	73	109	138	216	251	264	291	312	313	257	272	274	221	144	102	68	43	34
West South Central	399	436	491	668	780	878	964	1,138	1,103	1,017	996	943	755	431	317	139	99	43
Arkansas	60	80	95	145	182	199	217	253	242	222	233	215	179	125	94	49	39	18
Louisiana	42	62	74	111	124	129	150	170	161	132	135	121	118	69	48	28	17	13
Oklahoma	83	89	95	119	142	165	180	213	204	197	192	190	[2]108	[2]9				
Texas	214	205	227	293	332	385	416	501	496	466	436	418	352	228	174	61	43	12
West	265	306	319	423	468	494	515	571	510	499	484	378	245	146	84	48	35	7
Mountain	120	134	149	180	195	213	233	271	241	233	244	183	101	49	25	14	9	5
Montana	25	27	29	33	36	38	42	51	47	47	58	26	13	6	2	1		
Idaho	25	30	34	39	40	41	44	45	42	41	42	31	17	7	2	(Z)		
Wyoming	9	9	10	11	13	13	15	17	16	16	16	11	6	3	(Z)	(Z)		
Colorado	28	30	33	41	46	48	51	64	60	58	60	46	25	16	5	2		
New Mexico	12	14	18	21	24	30	34	41	31	32	30	36	12	4	5	4	5	4
Arizona	6	6	7	9	10	13	18	19	14	11	10	9	6	1	1	(Z)		
Utah	13	15	18	23	24	26	25	31	27	26	26	22	19	11	9	5	4	1
Nevada	2	2	2	3	3	3	4	4	3	4	3	3	2	1	1	1	(Z)	
Pacific	145	171	200	243	273	282	282	300	268	266	240	194	144	96	59	34	26	2
Washington	34	46	52	65	70	80	82	84	71	73	68	56	33	18	7	3	1	
Oregon	29	40	43	54	60	63	62	65	55	56	50	46	36	26	16	8	6	1
California	78	81	99	123	137	139	133	150	136	136	118	88	73	53	36	24	19	1
Alaska	(Z)	(Z)	(Z)		1		1		1		(Z)	(Z)	(Z)					
Hawaii	4	5	6		6		5		5		5	4	2					

Table A-3. Land in Farms in the U.S., 1850-1969, By Division, Region, and State.

Division, region, and State	Land in farms (1,000 acres)																	
	1969	1964	1959	1954	1950	1945	1940	1935	1930	1925	1920	1910	1900	1890	1880	1870	1860	1850
United States	1,063,346	1,110,187	1,123,508	1,158,192	1,161,420	1,141,615	1,065,114	1,054,515	990,112	924,319	958,677	881,431	841,202	623,219	536,082	407,735	407,213	293,561
Northeast	25,683	31,979	36,047	41,019	44,402	48,903	47,010	51,919	49,330	53,349	57,564	62,906	65,409	62,744	67,986	62,744	61,082	55,163
New England	5,599	7,744	9,316	11,121	12,547	14,497	13,371	15,463	14,283	15,858	16,991	19,715	20,549	19,756	21,484	19,570	20,111	18,367
Maine	1,760	2,590	3,082	3,614	4,182	4,613	4,223	4,722	4,640	5,161	5,426	6,297	6,300	6,180	6,553	5,838	5,728	4,555
New Hampshire	613	903	1,124	1,457	1,714	2,017	1,809	2,116	1,960	2,262	2,604	3,249	3,610	3,459	3,721	3,606	3,745	3,392
Vermont	1,916	2,624	2,945	3,318	3,527	3,931	3,667	4,043	3,896	3,926	4,236	4,664	4,724	4,396	4,883	4,529	4,274	4,126
Massachusetts	701	902	1,142	1,439	1,660	2,078	1,938	2,196	2,005	2,368	2,494	2,876	3,147	2,998	3,359	2,730	3,339	3,356
Rhode Island	69	104	138	155	191	265	222	308	279	309	332	443	456	469	515	502	521	554
Connecticut	541	721	884	1,138	1,272	1,593	1,512	2,080	1,502	1,832	1,899	2,186	2,312	2,253	2,454	2,364	2,504	2,384
Middle Atlantic	20,085	24,235	26,730	29,898	31,865	34,406	33,639	36,455	35,047	37,491	40,573	43,191	44,860	42,988	46,502	43,175	40,971	36,795
New York	10,148	12,275	13,490	15,071	16,017	17,568	17,170	18,686	17,980	19,270	20,633	22,030	22,648	21,962	23,781	22,191	20,975	19,119
New Jersey	1,036	1,156	1,379	1,665	1,725	1,818	1,874	1,914	1,758	1,925	2,283	2,574	2,841	2,662	2,930	2,990	2,984	2,753
Pennsylvania	8,901	10,804	11,862	13,162	14,113	15,020	14,594	15,855	15,309	16,296	17,658	18,587	19,371	18,364	19,791	17,994	17,012	14,923
North Central	373,369	383,090	385,394	393,458	396,427	398,812	388,078	390,034	376,379	360,834	374,708	350,577	317,349	256,587	206,982	139,215	107,900	62,686
East North Central	94,607	99,486	103,386	108,597	112,098	115,564	113,655	116,957	110,891	112,752	117,735	117,929	116,341	105,787	105,785	87,449	72,697	50,189
Ohio	17,111	17,619	18,507	19,992	20,969	21,928	21,908	22,858	21,514	22,219	23,516	24,106	24,502	23,352	24,529	21,712	20,472	17,997
Indiana	17,573	17,933	18,613	19,233	19,659	20,027	19,801	20,519	19,689	19,915	21,063	21,300	21,620	20,363	20,421	18,120	16,388	12,793
Illinois	29,913	29,958	30,327	30,399	30,978	31,602	31,033	31,661	30,695	30,732	31,975	32,523	32,795	30,498	31,674	25,883	20,912	12,037
Michigan	11,901	13,599	14,783	16,467	17,270	18,392	18,038	18,460	17,119	18,035	19,033	18,941	17,562	14,786	13,807	10,019	7,031	4,384
Wisconsin	18,109	20,378	21,156	22,507	23,221	23,615	22,876	23,459	21,874	21,851	22,148	21,060	19,863	16,788	15,353	11,715	7,894	2,977
West North Central	278,761	283,603	282,007	284,861	284,329	283,248	274,423	273,077	265,488	248,081	256,973	232,648	201,009	150,800	101,198	51,766	35,203	12,498
Minnesota	28,845	30,805	30,796	32,285	32,883	33,140	32,607	32,818	30,913	30,059	30,222	27,676	26,248	18,664	13,403	6,484	2,712	29
Iowa	33,570	33,758	33,831	34,045	34,265	34,454	34,149	34,359	34,019	33,281	33,476	33,931	34,574	30,492	24,753	15,542	10,070	2,736
Missouri	32,420	32,692	33,155	34,195	35,123	35,278	34,740	35,055	33,743	32,642	34,775	34,591	33,998	30,780	27,879	21,707	19,985	9,733
North Dakota	43,118	42,717	41,466	41,877	41,194	41,001	37,936	39,118	36,658	34,327	36,215	28,427	15,543	7,660	1,028	[1] 302	[1] 26	-------
South Dakota	45,584	45,567	44,851	44,949	44,786	43,032	39,474	37,102	36,470	32,018	34,636	26,017	19,071	11,396	2,773			-------
Nebraska	45,834	47,793	47,756	47,487	47,467	47,753	47,344	46,616	44,709	42,025	42,225	38,622	29,912	21,593	9,945	2,074	631	-------
Kansas	49,390	50,271	50,153	50,024	48,611	48,589	48,174	48,010	46,976	43,729	45,425	43,385	41,663	30,214	21,417	5,657	1,778	-------
South	332,308	346,228	357,448	386,289	393,215	377,795	370,168	378,206	343,086	324,189	350,122	354,453	362,036	256,606	234,920	189,556	225,514	171,047
South Atlantic	68,031	76,959	83,339	98,259	102,170	96,601	92,555	95,987	86,363	88,571	97,775	103,782	104,298	100,158	101,420	90,213	106,521	93,402
Delaware	674	717	763	814	851	923	896	921	901	900	945	1,039	1,066	1,056	1,090	1,052	1,004	956
Maryland	2,803	3,181	3,457	3,897	4,056	4,200	4,198	4,384	4,374	4,433	4,758	5,057	5,170	4,952	5,120	4,513	4,836	4,634
District of Columbia	-------	-------	-------	-------	1	2	2	3	3	4	6	6	8	12	18	12	34	27
Virginia	10,650	12,002	13,126	14,686	15,572	16,358	16,445	17,645	16,729	17,210	18,561	19,496	19,908	19,105	19,836	18,146	31,117	26,152
West Virginia	4,341	5,279	6,063	7,352	8,215	8,720	8,909	9,424	8,802	8,980	9,570	10,026	10,655	10,821	10,194	8,528		
North Carolina	12,734	14,882	16,888	18,260	19,318	18,618	18,845	19,936	18,055	18,594	20,022	22,439	22,749	22,652	22,364	19,835	23,763	20,997
South Carolina	6,992	8,101	9,149	11,069	11,879	11,022	11,239	12,330	10,393	10,639	12,427	13,512	13,985	13,185	13,458	12,105	16,196	16,218
Georgia	15,806	17,887	19,658	24,019	25,751	23,676	23,684	25,297	22,079	21,945	25,441	26,953	26,392	25,200	26,043	23,648	26,650	22,821
Florida	14,032	15,411	15,237	18,162	19,528	13,084	8,338	6,048	5,027	5,865	6,047	5,254	4,364	3,674	3,297	2,374	2,920	1,595
East South Central	60,719	64,509	68,285	77,202	79,576	76,198	77,086	79,101	72,817	70,607	78,897	81,521	81,248	78,999	76,873	66,324	74,777	58,562
Kentucky	15,968	16,265	17,931	18,034	19,442	19,725	20,294	20,699	19,927	19,913	21,613	22,189	21,979	21,412	21,496	18,660	19,163	16,950
Tennessee	15,057	15,266	16,081	17,654	18,534	17,789	18,493	19,086	18,003	17,901	19,511	20,042	20,342	20,162	20,667	19,581	20,669	18,984
Alabama	13,654	15,226	16,543	20,810	20,889	19,068	19,143	19,661	17,655	16,739	19,577	20,732	20,685	19,853	18,855	14,961	19,105	12,138
Mississippi	16,040	17,752	18,630	20,702	20,711	19,617	19,156	19,655	17,332	16,053	18,197	18,558	18,241	17,573	15,855	13,121	15,840	10,490
West South Central	204,058	204,760	205,824	210,828	211,469	204,995	200,527	201,118	183,906	165,013	173,449	169,150	176,491	77,449	56,627	33,020	44,216	19,084
Arkansas	15,695	16,565	16,457	17,944	18,871	17,456	18,045	17,742	16,053	15,632	17,457	17,416	16,637	14,891	12,062	7,597	9,574	2,598
Louisiana	9,789	10,411	10,347	11,441	11,202	10,040	9,996	10,444	9,355	8,838	10,020	10,439	11,059	9,544	8,274	7,026	9,299	4,989
Oklahoma	36,008	36,077	35,801	35,630	36,007	36,162	34,803	35,335	33,791	30,869	31,952	28,859	[2] 22,988	[2] 1,506	-------	-------	-------	-------
Texas	142,567	141,706	143,218	145,813	145,389	141,338	137,683	137,597	124,707	109,674	114,021	112,435	125,807	51,407	36,292	1,8397	25,344	11,496
West	331,486	348,890	344,620	337,426	327,377	316,105	259,857	236,356	221,316	185,947	176,283	113,495	96,407	47,282	26,194	16,219	12,718	4,664
Mountain	256,525	268,003	264,429	260,942	250,213	244,577	191,901	173,881	157,450	131,689	117,337	59,533	46,397	14,766	3,976	1,754	1,561	337
Montana	62,918	65,834	64,081	61,469	59,247	58,787	46,452	47,512	44,669	32,736	35,071	13,546	11,844	1,964	406	140	-------	-------
Idaho	14,417	15,302	15,232	14,364	13,224	12,503	10,298	9,952	9,347	8,116	8,376	5,284	3,205	1,302	328	77	-------	-------
Wyoming	35,476	37,053	36,200	34,989	34,421	33,117	28,026	28,162	23,525	18,663	11,809	8,543	8,125	1,830	124	4	-------	-------
Colorado	36,697	38,259	38,787	38,385	37,953	36,218	31,527	29,978	28,876	24,167	24,462	13,532	9,475	4,699	1,165	320	-------	-------
New Mexico	46,792	47,647	46,293	49,451	47,522	49,608	38,860	34,397	30,822	27,850	24,410	11,270	5,131	788	631	834	1,415	291
Arizona	38,203	40,569	40,203	41,790	39,916	37,856	25,651	14,019	10,527	11,065	5,802	1,247	1,935	1,297	136	22	-------	-------
Utah	11,313	12,867	12,689	12,262	10,865	10,309	7,302	6,239	5,613	5,001	5,050	3,398	4,117	1,324	656	148	90	47
Nevada	10,708	10,483	10,943	8,231	7,064	6,178	3,785	3,622	4,081	4,091	2,357	2,715	2,566	1,661	531	209	56	-------
Pacific	74,962	80,887	80,191	76,484	77,164	71,529	67,956	62,476	63,866	54,258	58,946	53,962	50,009	32,516	22,218	14,465	11,157	4,327
Washington	17,559	19,053	18,717	17,641	17,369	16,720	15,182	14,680	13,534	12,610	13,246	11,712	8,409	4,179	1,409	649	366	-------
Oregon	18,018	20,509	21,236	21,047	20,328	19,754	17,988	17,358	16,549	14,131	13,542	11,685	10,071	6,910	4,215	2,389	2,061	433
California	35,722	37,011	36,888	37,795	36,619	35,054	30,524	30,438	30,443	27,517	29,366	27,931	28,829	21,427	16,594	11,427	8,730	3,894
Alaska	1,604	1,959	888	-------	422	-------	1,776	-------	526	-------	91	43	(Z)	-------	-------	-------	-------	-------
Hawaii	2,058	2,364	2,461	-------	2,432	-------	2,486	-------	2,815	-------	3,702	2,591	2,610	-------	-------	-------	-------	-------

[1] footnotes at end of table.

opposed to about 35 percent for the U.S. as a whole. The majority of noncropland in Northeast farms is in forests, while nationally nearly two-thirds of noncropland in U.S. farms is devoted to pasture. Nevertheless, the data in Table A-3 underscore the rapid decline in land devoted to agriculture in the Northeast since the turn of the century. Land in farms in the Northeast declined steadily after 1900, with the exception of the Great Depression and World War II interlude during which farm numbers and land in farms registered temporary increases throughout the U.S. By 1969, less than 3 percent of the land in farms in the U.S. was in the Northeast region. About 80 percent of the land in Northeast farms lies in the three Middle Atlantic states.

Average acreage per farm. The Northeast has long had relatively small farm operations by comparison with the U.S. as a whole, as indicated in Table A-4. Average acreage per farm in the Northeast was virtually constant from the late 1800s to the end of World War II, averaging roughly 100 acres per farm during the 65 years from 1880 to 1945. By comparison, average acreage per farm in the U.S. after 1880 rose steadily, with the exception of a slight decline in average acreage during the first half-decade of the Great Depression.

Following the end of World War II, average acreage per farm in the Northeast began to increase, from 98 acres per farm in 1945 to 169 acres in 1969, a 72 percent increase. This rate of increase, however, was smaller than for the U.S. as a whole (from 195 acres per farm in 1945 to 390 acres in 1969, a 100 percent increase). Average acreage in farms in the New England subregion increased more rapidly than in the Middle Atlantic subregion during the post-World War II period. In 1969, New England farms averaged 195 acres, while Middle Atlantic farms averaged 163 acres.

Average value of farm property per farm. Table A-5 reports data on the average value of farm property per farm from 1850 to 1969 for the Northeast Region and the U.S. These data indicate that average value of farm property per farm in the Northeast was substantially above the national average until the turn of the century. After 1900, however, the value of farm property per farm in the Northeast was generally lower than that of the U.S. as whole, with the exception of the Great Depression decade. Moreover, these disparities have generally increased so that by 1969, Northeast farms averaged $59,426 in farm property while U.S. farms averaged $75,725. Average value of farm property per farm in the six New England states was virtually identical to that of the three Middle Atlantic states in both 1945 and 1969.

Value of farm products sold. Data on the total value of farm products sold for the Northeast Region and the U.S. from 1930 to 1969 are given in Table A-6. These data show that at the onset of the Great Depression, farmers in the nine Northeastern states accounted for roughly 10 percent of the value of total U.S. farm products sold (978 and 9,610 million, respectively). With the exception of the Great Depression decade, the Northeast Region has experienced a slow decline in its relative share of farm products sold. By 1969, the value of farm products sold by farmers in the Northeast Region was about $2.8 billion, which represented slightly over 6 percent of the $45.6 billion of farm products sold by U.S. farmers in that year. Within the Northeast Region, the Middle Atlantic states, especially

Table A-4. Average Acreage Per Farm in the U.S., 1850-1969, By Division, Region, and State.

Division, region, and State	Average acreage per farm (acres)																	
	1969	1964	1959	1954	1950	1945	1940	1935	1930	1925	1920	1910	1900	1890	1880	1870	1860	1850
United States	390	352	303	242	216	195	175	155	157	145	149	139	147	137	134	153	199	203
Northeast	169	158	142	121	112	98	97	93	102	92	99	96	97	95	98	104	108	113
New England	195	185	164	136	122	96	99	98	114	99	109	104	107	104	104	108	109	110
Maine	221	201	178	155	138	109	108	113	119	103	113	105	106	100	102	98	103	97
New Hampshire	211	194	172	140	128	107	109	120	132	107	127	120	123	119	116	122	123	116
Vermont	279	273	243	208	185	148	166	149	157	141	146	143	143	135	138	134	136	139
Massachusetts	123	113	102	83	75	56	61	63	78	71	78	78	83	87	88	103	94	99
Rhode Island	98	94	99	77	74	74	74	71	84	79	81	84	83	85	83	94	96	103
Connecticut	121	119	107	89	82	72	72	65	87	79	84	82	86	86	80	93	100	106
Middle Atlantic	163	151	135	116	107	99	97	92	98	90	95	92	92	92	95	103	108	114
New York	196	185	164	143	128	118	112	106	113	102	107	102	100	97	99	103	107	112
New Jersey	122	109	89	73	70	69	73	65	69	65	77	77	82	86	85	98	108	115
Pennsylvania	142	130	119	102	96	87	86	83	89	81	87	85	86	87	90	103	109	117
North Central	324	300	264	231	212	201	185	172	181	167	172	157	145	133	122	124	140	143
East North Central	184	173	155	136	127	121	113	108	115	107	109	105	102	105	107	115	124	136
Ohio	154	146	132	113	105	99	94	90	98	91	92	89	89	93	99	111	114	125
Indiana	173	166	145	125	118	114	107	102	108	102	103	99	97	103	105	112	124	136
Illinois	242	226	196	173	169	156	145	137	143	136	135	129	124	127	124	128	146	158
Michigan	153	145	132	119	111	105	96	94	101	94	97	92	86	86	90	101	113	129
Wisconsin	183	172	161	147	138	133	123	117	120	113	117	119	117	115	114	114	114	148
West North Central	437	403	356	315	289	275	252	231	239	223	234	210	190	165	142	143	190	180
Minnesota	261	236	211	195	184	175	166	161	167	160	169	177	170	160	145	139	149	184
Iowa	239	219	194	177	169	165	160	155	158	156	157	156	151	151	134	134	166	185
Missouri	237	222	197	170	153	146	136	126	132	125	132	125	119	129	129	146	215	179
North Dakota	930	876	756	676	630	590	513	462	496	452	466	382	343	277	271	[1] 176	[1] 215	--------
South Dakota	997	917	805	719	674	626	545	445	439	403	464	335	362	227	203			--------
Nebraska	634	596	528	471	443	427	391	349	345	329	339	298	246	190	157	169	226	--------
Kansas	574	544	481	416	370	344	308	275	283	264	275	244	241	181	155	148	171	--------
South	287	252	217	167	148	131	123	110	106	104	109	114	138	140	153	214	335	332
South Atlantic	164	164	141	114	107	93	91	84	82	80	84	93	108	134	157	241	353	376
Delaware	182	163	146	129	114	99	100	89	93	88	93	96	110	113	125	138	151	158
Maryland	163	153	138	120	112	102	100	99	101	91	99	103	112	121	126	167	190	212
Virginia	165	149	135	108	103	95	94	89	98	89	100	106	119	150	167	246	336	340
West Virginia	188	153	138	107	101	89	90	90	107	99	110	104	115	142	163	214		
North Carolina	107	97	83	68	67	65	68	66	65	66	74	88	101	127	142	212	316	369
South Carolina	177	144	117	89	85	75	82	75	66	62	65	77	90	115	143	233	488	541
Georgia	234	215	185	145	130	105	110	101	86	88	82	93	118	147	188	338	430	441
Florida	394	360	338	316	290	214	134	83	85	99	112	105	107	107	141	232	444	371
East South Central	155	138	121	98	87	79	75	70	69	70	75	78	90	121	135	178	276	262
Kentucky	128	122	113	93	89	83	80	74	81	77	80	86	94	119	129	158	211	227
Tennessee	124	114	102	87	80	76	75	70	73	71	77	82	91	116	125	166	251	261
Alabama	188	165	143	118	99	85	83	72	68	70	76	79	93	126	139	222	347	289
Mississippi	221	163	135	96	82	74	66	63	55	62	67	68	83	122	156	193	370	309
West South Central	511	469	419	316	271	234	208	177	167	162	174	179	234	180	179	238	446	440
Arkansas	260	207	173	124	103	88	83	70	66	70	75	81	93	119	128	154	245	140
Louisiana	232	167	139	103	90	78	67	61	58	67	74	87	95	138	171	247	537	372
Oklahoma	434	407	378	300	253	219	194	166	166	157	166	152	[2] 213	[2] 162	--------	--------	--------	--------
Texas	668	691	631	498	439	367	329	275	252	236	262	269	357	225	208	301	591	943
West	1,259	1,142	987	796	700	639	504	414	434	373	364	300	393	324	313	336	367	695
Mountain	2,139	1,998	1,774	1,460	1,284	1,151	822	641	653	564	481	325	458	299	159	127	177	72
Montana	2,522	2,437	2,213	1,859	1,689	1,557	1,111	940	940	698	608	517	886	361	267	164	--------	--------
Idaho	566	516	452	371	328	301	236	221	224	200	199	172	183	197	174	186	--------	--------
Wyoming	4,014	4,100	3,715	3,069	2,729	2,533	1,866	1,610	1,469	1,203	750	778	1,333	586	272	25	--------	--------
Colorado	1,313	1,284	1,162	942	833	761	613	471	482	417	408	293	384	281	259	184	--------	--------
New Mexico	4,020	3,354	2,908	2,347	2,014	1,671	1,139	832	982	879	818	316	417	177	125	186	278	78
Arizona	6,486	6,262	5,558	4,483	3,834	2,881	1,389	746	743	1,024	582	135	333	910	177	127	--------	--------
Utah	867	817	712	537	449	392	287	203	207	192	197	157	212	126	69	30	26	51
Nevada	5,070	4,862	4,649	2,861	2,271	1,802	1,059	980	1,186	1,054	745	1,010	1,175	1,301	378	201	617	--------
Pacific	516	472	401	(NA)	283	(NA)	241	(NA)	238	(NA)	246	278	348	337	379	420	432	2,125
Washington	516	418	363	271	249	209	186	174	191	172	200	208	256	231	216	208	275	--------
Oregon	620	516	499	387	340	313	291	268	300	253	270	257	281	271	260	315	355	372
California	459	468	372	307	267	252	230	202	224	202	260	317	397	405	462	482	466	4,466
Alaska	4,832	5,129	2,421	--------	803	--------	2,850	--------	1,062	--------	249	192	13	--------	--------	--------	--------	--------
Hawaii	528	484	394	--------	423	--------	498	--------	426	--------	511	600	1,148	--------	--------	--------	--------	--------

See footnotes at end of table.

Table A-5. Average Value of Farm Property Per Farm in the U.S., 1850-1969, By Division, Region, and State.

Division, region, and State	Average value per farm (dollars)																	
	1969	1964	1959	1954	1950	1945	1940	1935	1930	1925	1920	1910	1900	1890	1880	1870	1860	1850
United States	75,725	50,646	34,768	20,405	14,005	7,917	5,532	4,823	7,524	7,764	10,295	5,480	2,905	2,909	2,544	2,799	3,251	2,258
Northeast	59,426	34,130	24,702	15,950	11,771	6,685	5,751	5,473	7,789	6,407	6,738	4,811	3,656	3,856	4,027	4,201	3,756	2,971
New England	62,937	34,762	24,860	15,303	11,839	6,244	5,478	(NA)	(NA)	5,678	5,860	3,806	2,753	2,577	2,802	2,591	2,589	2,221
Maine	35,496	19,979	14,756	9,392	7,462	3,785	3,183	3,425	4,981	3,943	4,232	2,660	1,627	1,589	1,592	1,377	1,413	1,173
New Hampshire	50,418	25,402	18,046	11,989	9,323	4,280	3,758	3,783	5,190	4,113	4,385	3,176	2,391	2,270	2,356	2,175	2,285	1,890
Vermont	62,347	29,733	19,837	12,662	10,314	5,080	4,712	4,286	5,861	4,940	5,473	3,442	2,509	2,469	3,078	3,296	2,988	2,129
Massachusetts	69,362	43,492	31,692	18,552	14,163	7,167	6,647	7,285	10,205	7,611	7,737	5,260	4,190	3,710	3,807	3,515	3,462	3,202
Rhode Island	72,033	46,030	37,571	26,475	17,062	9,883	8,737	8,144	10,388	7,139	6,463	5,278	4,206	3,977	4,164	3,215	3,616	3,170
Connecticut	111,071	67,429	47,372	25,971	20,189	11,826	9,675	8,828	13,226	8,689	8,399	5,158	3,615	3,605	3,957	3,897	3,607	3,240
Middle Atlantic	58,609	33,964	24,657	16,156	11,747	6,875	5,858	-------	-------	6,584	7,061	5,216	4,013	4,374	4,546	4,892	4,319	3,361
New York	53,399	32,797	23,936	15,844	11,742	7,275	6,180	5,905	8,234	7,243	7,376	5,495	3,917	4,280	4,381	4,709	4,078	3,250
New Jersey	133,202	73,487	46,397	29,635	20,343	11,171	8,818	7,977	11,776	8,848	8,428	6,484	4,692	5,166	5,564	6,721	6,520	5,030
Pennsylvania	62,829	29,836	21,892	14,039	10,299	5,872	5,113	4,505	6,977	5,838	6,560	4,747	4,006	4,359	4,569	4,796	4,234	3,197
North Central	75,002	50,244	37,974	25,010	18,065	11,116	7,693	7,061	11,781	12,740	18,063	9,174	4,354	3,675	3,021	3,068	2,758	1,718
East North Central	71,465	48,656	37,132	23,717	16,607	10,441	7,289	(NA)	(NA)	10,483	13,771	7,899	4,325	4,065	3,683	3,475	2,958	1,824
Ohio	61,251	43,373	32,583	20,937	14,341	8,470	6,176	5,007	7,720	7,951	10,368	6,080	3,746	4,176	4,561	4,305	3,770	2,495
Indiana	70,316	51,645	38,489	24,303	16,151	10,197	6,781	5,180	7,796	8,661	12,937	7,899	3,793	3,809	3,274	3,149	2,706	1,453
Illinois	118,507	80,894	61,946	40,083	27,628	17,933	11,887	9,636	15,553	18,615	25,289	13,986	6,684	5,247	3,948	3,631	2,854	1,261
Michigan	49,821	34,027	25,635	15,800	10,936	6,843	4,865	4,205	6,853	6,676	7,313	4,354	2,866	3,227	3,241	3,225	2,577	1,522
Wisconsin	42,448	26,765	21,309	14,789	12,203	8,069	6,365	6,238	9,626	9,830	11,558	6,784	4,041	3,262	2,663	2,336	1,893	1,414
West North Central	77,845	61,539	38,680	26,151	19,379	11,739	8,065	-------	-------	14,876	22,307	10,464	4,385	3,245	2,105	2,215	2,126	1,153
Minnesota	58,803	39,075	32,605	21,051	15,507	9,705	1,312	6,803	11,471	12,717	18,496	8,085	4,329	2,910	2,097	1,683	1,513	1,032
Iowa	93,694	59,553	49,150	35,090	27,105	17,284	12,614	11,092	19,655	23,207	35,616	16,008	6,550	4,247	3,061	2,701	1,960	1,125
Missouri	53,034	33,451	22,094	13,815	9,720	6,285	4,324	3,948	7,018	7,691	11,646	6,190	2,963	2,629	1,742	2,119	2,485	1,161
North Dakota	87,222	58,450	38,978	24,110	18,178	10,189	6,628	8,358	12,199	13,428	19,160	11,063	4,385	2,728	2,263	[1]970	[1]784	-------
South Dakota	83,427	56,615	40,852	28,263	21,095	11,124	6,976	8,305	15,455	18,071	33,132	12,945	4,183	2,143	1,013			
Nebraska	97,931	65,268	46,796	33,713	25,517	15,205	9,399	11,696	19,274	19,760	29,836	13,983	4,753	3,542	1,671	1,967	1,391	-------
Kansas	91,131	66,397	48,084	33,117	24,344	13,962	9,092	8,469	13,738	13,250	17,122	9,770	3,718	3,359	1,697	1,892	1,179	-------
South	59,983	37,931	23,702	12,765	8,654	4,564	3,231	2,553	3,829	3,685	4,727	2,374	1,251	1,402	1,224	1,456	3,455	2,051
South Atlantic	55,355	34,496	21,671	11,123	7,466	4,062	3,099	(NA)	(NA)	3,699	4,488	2,236	1,254	1,515	1,384	1,632	3,340	2,323
Delaware	90,632	53,443	34,551	20,287	13,043	7,820	6,104	4,959	6,896	5,818	6,386	4,906	3,555	4,220	4,205	4,907	4,720	3,114
Maryland	104,370	64,999	39,095	21,258	14,048	8,596	6,506	5,465	8,244	6,966	8,070	4,941	3,807	4,291	4,085	5,048	5,726	3,988
District of Columbia	-------	-------	-------	-------	166,643	24,034	91,429	80,709	68,690	34,500	27,340	37,932	41,911	16,940	8,350	14,546	12,560	6,481
Virginia	47,191	27,572	18,635	11,369	8,458	5,021	3,660	3,005	5,016	4,578	5,501	2,891	1,618	1,994	1,823	2,308	4,014	2,810
West Virginia	25,450	13,882	10,230	7,248	5,983	3,494	2,718	2,259	4,138	3,941	4,706	2,735	1,812	2,087	2,124	2,043		
North Carolina	35,551	24,442	16,475	8,758	6,605	3,490	2,647	2,069	3,018	3,267	3,990	1,800	867	1,031	862	669	1,906	1,192
South Carolina	46,171	24,948	15,685	7,769	5,886	2,982	2,461	1,726	2,401	2,649	4,222	1,887	816	862	732	691	4,210	2,751
Georgia	54,883	29,155	17,944	8,710	5,623	2,896	2,223	1,715	2,259	2,359	3,663	1,647	816	889	807	1,081	2,533	1,850
Florida	139,818	109,053	73,554	33,627	16,617	8,149	5,211	4,407	7,179	8,088	5,212	2,362	1,000	2,125	866	777	2,502	1,469
East South Central	37,135	21,897	13,962	7,709	5,662	3,224	2,272	-------	-------	2,466	3,484	1,668	1,034	1,262	1,190	1,461	3,428	1,665
Kentucky	32,309	22,235	15,269	8,900	7,196	4,259	3,070	2,229	3,595	3,278	4,823	2,452	1,628	1,932	1,798	2,103	3,210	2,073
Tennessee	33,176	20,609	13,288	8,049	6,182	3,715	2,683	2,030	3,025	3,006	4,055	1,953	1,180	1,392	1,248	1,481	3,294	1,345
Alabama	37,596	20,652	12,780	6,816	4,809	2,506	1,764	1,347	1,952	1,746	2,123	1,096	603	704	581	804	3,189	1,533
Mississippi	51,611	24,322	14,292	7,053	4,566	2,457	1,632	1,190	1,818	1,785	2,903	1,218	688	883	912	961	4,453	1,612
West South Central	86,681	58,826	37,306	20,817	13,616	6,626	4,388	-------	-------	4,875	6,316	3,317	1,509	1,421	958	969	3,876	2,481
Arkansas	67,632	36,734	18,915	9,496	6,225	3,334	2,108	1,486	2,261	2,436	3,238	1,440	757	950	786	648	2,350	860
Louisiana	74,414	38,636	23,719	11,497	7,416	3,653	2,359	1,736	2,590	2,461	3,499	1,971	1,217	232	1,222	1,916	11,818	5,549
Oklahoma	74,838	49,212	31,710	18,964	13,016	6,713	4,625	3,677	6,096	5,318	7,104	3,884	[1]1,582	[1]972	-------	-------	-------	-------
Texas	99,133	77,756	51,787	30,711	20,263	9,286	6,196	5,137	7,260	6,540	8,486	4,412	1,964	1,753	979	787	2,054	1,357
West	157,179	120,383	80,870	47,334	30,029	15,853	9,962	8,928	14,518	13,364	16,465	10,271	5,329	7,506	4,669	3,662	2,033	1,295
Mountain	145,486	101,780	72,967	43,191	28,294	12,969	7,623	(NA)	(NA)	9,310	12,958	7,192	3,942	4,019	2,319	651	493	420
Montana	150,222	103,271	76,761	44,653	28,475	13,720	8,373	7,433	11,109	9,709	13,468	9,599	4,639	4,653	2,129	685	-------	-------
Idaho	99,916	68,178	50,528	33,466	22,920	11,888	7,768	6,814	10,012	9,197	13,811	7,965	2,422	2,640	1,503	952	-------	-------
Wyoming	163,529	115,355	79,447	46,935	36,060	17,746	10,585	9,537	12,919	11,132	14,907	8,912	4,424	4,627	1,829	83	-------	-------
Colorado	124,180	90,183	61,494	37,513	26,588	11,855	7,550	6,580	10,497	10,211	14,449	8,848	4,305	5,189	5,672	1,558	-------	-------
New Mexico	168,836	117,042	68,233	50,078	30,228	11,004	5,498	4,113	6,619	5,520	7,432	3,135	1,697	1,826	1,091	404	532	441
Arizona	452,241	330,549	209,724	115,330	57,996	21,905	8,321	7,047	12,999	13,332	17,276	5,125	2,355	5,065	1,471	750	-------	-------
Utah	79,705	57,747	42,391	25,652	19,492	9,947	6,074	5,157	8,135	7,395	9,499	5,423	2,619	2,701	1,483	375	367	337
Nevada	270,507	182,436	141,974	78,162	43,700	20,985	13,321	11,518	18,626	17,512	20,947	14,730	7,150	9,663	3,852	1,434	3,322	-------
Pacific	166,834	134,929	[1]89,632	50,406	31,266	18,028	11,720	(NA)	(NA)	16,926	19,941	13,050	6,751	9,291	5,672	4,866	2,559	3,302
Washington	115,487	64,304	47,590	31,018	21,057	11,268	7,264	6,527	10,911	9,921	13,885	10,179	3,482	4,622	2,120	1,272	1,668	-------
Oregon	93,134	59,079	43,608	30,178	20,327	11,054	7,712	6,922	11,438	11,019	13,449	10,012	3,693	4,537	3,509	2,946	2,618	2,448
California	217,730	214,650	131,212	69,620	41,192	25,084	16,331	15,466	25,203	23,111	26,122	16,447	9,759	13,180	7,293	5,953	2,603	4,443
Alaska	61,541	47,160	48,379	-------	12,465	-------	6,165	-------	5,714	-------	8,323	8,908	-------	-------	-------	-------	-------	-------
Hawaii	156,800	98,936	(NA)	-------	33,961	-------	22,580	-------	18,771	-------	24,438	19,197	26,410	-------	-------	-------	-------	-------

See footnotes at end of table.

Table A-6. Value of Farm Products Sold, U.S. Farms, 1925-1969, By Division, Region, and State.

Division, region, and State	Value of farm products sold (mil. dol.)								
	1969	1964	1959	1954	1950	1945	1940	1930	1925 [4]
United States	45,609	35,292	30,493	24,645	22,217	16,231	6,682	9,610	858
Northeast	2,822	2,575	2,292	2,049	1,922	1,490	723	978	71
New England	683	716	593	535	532	426	208	278	21
Maine	198	256	171	140	126	96	42	81	4
New Hampshire	49	49	48	45	46	39	19	24	(Z)
Vermont	136	115	109	86	87	70	33	48	4
Massachusetts	139	139	126	125	135	115	63	68	4
Rhode Island	16	19	18	15	16	15	8	9	1
Connecticut	146	139	120	123	121	89	44	48	8
Middle Atlantic	2,138	1,859	1,699	1,514	1,391	1,065	515	699	50
New York	979	853	755	668	630	504	242	343	38
New Jersey	214	216	231	242	214	166	74	83	2
Pennsylvania	945	791	713	604	546	396	198	273	10
North Central	20,097	14,838	13,002	10,647	9,733	7,047	2,923	4,140	437
East North Central	7,544	6,105	5,203	4,594	4,044	2,953	1,302	1,608	145
Ohio	1,246	1,013	863	844	712	533	254	315	28
Indiana	1,400	1,105	946	906	732	492	217	265	17
Illinois	2,612	2,123	1,811	1,506	1,362	954	415	455	53
Michigan	829	766	623	545	474	366	178	227	20
Wisconsin	1,455	1,097	961	793	765	608	239	346	27
West North Central	12,553	8,733	7,799	6,053	5,689	4,094	1,620	2,531	292
Minnesota	1,748	1,376	1,212	984	961	637	301	361	73
Iowa	3,656	2,597	2,284	1,840	1,636	1,152	512	621	81
Missouri	1,460	1,053	1,012	734	720	506	215	329	33
North Dakota	749	570	469	376	401	365	100	194	17
South Dakota	958	629	514	436	430	286	96	212	19
Nebraska	2,165	1,334	1,198	881	778	543	192	398	33
Kansas	1,818	1,175	1,111	802	765	604	204	418	37
South	13,354	10,586	9,884	7,025	6,359	4,632	1,921	2,903	199
South Atlantic	4,874	4,142	3,248	2,631	2,125	1,735	700	922	73
Delaware	129	108	86	82	76	62	16	18	(Z)
Maryland	340	276	231	195	172	137	55	77	7
District of Columbia	----	----	----	----	1	1	1	(Z)	----
Virginia	570	470	424	364	310	248	108	155	21
West Virginia	106	92	99	90	82	63	30	53	1
North Carolina	1,195	1,068	797	733	557	489	199	221	13
South Carolina	362	349	303	252	214	192	87	117	9
Georgia	1,040	826	607	448	375	302	122	197	9
Florida	1,132	954	700	466	339	240	80	83	13
East South Central	2,749	2,382	1,972	1,542	1,371	1,082	428	727	50
Kentucky	770	592	518	425	417	338	128	170	28
Tennessee	623	529	475	353	341	247	107	162	7
Alabama	670	537	414	304	274	213	77	165	7
Mississippi	685	724	566	460	340	284	115	230	8
West South Central	5,731	4,063	3,664	2,853	2,863	1,815	793	1,255	76
Arkansas	973	830	639	492	393	269	118	187	7
Louisiana	496	407	335	310	246	178	90	137	9
Oklahoma	969	601	581	409	471	369	146	264	21
Texas	3,293	2,225	2,109	1,642	1,753	1,000	439	666	39
West	9,337	7,293	6,316	4,924	4,203	3,062	1,115	1,589	151
Mountain	3,839	2,537	2,356	1,810	1,631	1,068	445	672	35
Montana	576	390	377	339	279	223	84	129	3
Idaho	650	478	438	332	281	215	84	127	3
Wyoming	249	151	162	115	122	83	46	59	1
Colorado	1,101	612	580	380	426	251	102	177	21
New Mexico	369	227	197	155	155	82	43	56	3
Arizona	611	469	388	328	204	95	35	47	2
Utah	213	159	156	127	130	97	40	59	2
Nevada	81	51	57	34	34	23	11	19	(Z)
Pacific	5,498	4,756	3,959	3,113	2,571	1,994	666	916	116
Washington	771	637	569	506	365	354	117	184	21
Oregon	531	428	412	346	298	239	99	125	8
California	3,904	3,499	2,822	2,261	1,742	1,400	452	608	87
Alaska	4	4	3	----	2	----	----	----	----
Hawaii	288	188	152	----	165	----	----	----	----

NA Not available.
Z Less than 500 or $500,000.
[1] Dakota Territory.
[2] Oklahoma Territory and Indian Territory.
[3] Oklahoma Territory only.
[4] Products sold through cooperative marketing organizations only.

New York and Pennsylvania, have been far more dynamic in terms of aggregate gross farm sales than have the New England states. The Middle Atlantic states accounted for 76 percent of the region's sales of farm products in 1969 and exhibited a 100.1 percent increase in farm products sold from 1945-1969 as opposed to the 89.3 percent increase for the New England subregion. In addition, the total value of farm products sold in New England declined from 1964 to 1969, making New England the only one of the nine U.S. Census of Agriculture subregions to exhibit a decrease in sales of farm products during this period.

Farm structural change in the Northeast, 1900-1970: A summary. Farm structural change in the Northeast generally paralleled national trends during the first seven decades of the twentieth century, but did so on a less dynamic basis than the rest of the U.S. agricultural regions. The declining relative position of the Northeast in the U.S. farm structure reflected continuity with trends, discussed earlier, that began before 1850. The Northeast, with its generally low-quality soils, short growing seasons, and rough topography, had 60 percent less land in farms in 1969 than it did 100 years earlier. These agroecological conditions have contributed to the slow pace of centralization of farm land into larger units. Farms in the region generally were relatively small by national standards, and there was very little industrial-type farming in the region at the end of the 1960s. Thus, in the 25 years after World War II, the Northeast Region experienced declines in the number of farmers and the size of the farm population that were far more rapid than for the U.S. as a whole, but the pace of concentration of land and farm assets during the same period was far slower than the national average. As farmers and members of their families left agriculture, so did much of their land, most of which reverted to forests and brush (Stanton and Plimpton, 1979:11-14, 23).

Rural Communities and the Rural Population in the Northeast, 1900-1970

The character of our current knowledge on rural communities has changed dramatically since the 1920s through the 1950s when detailed community case studies--many of them done on a national basis--were quite common. As Larson (1981:147) has noted, "comprehensive information about rural communities and recent social change in American rural society does not equal that available in the 1920s, 1930s, and 1940s, aside from demographic and similar census-type data, [since] systematic nationwide studies that would provide this information have been discontinued." While the data on rural communities over the past two decades have been derived largely from census statistics, the data that are the basis of this section of the report were largely generated from "social surveys" of communities. The advantages of census-type data are their regular availability and suitability for statistical analyses using areal units (e.g., counties) as the units of analysis. The key advantage of the older method of community analysis was its richness of detail about the nature of social relationships and subcommunity processes. The very richness of these data, however, does not lend them to a brief summary for purposes such as those of this report. Fortunately, however, we will be able to make use of several useful summaries by Taylor et al. (1949), Kolb and Brunner (1952), Brunner and Kolb (1933), Richardson and Larson (1976), and others.

From the outset of the twentieth century, the Northeast has been the most highly urbanized region in the nation. As early as 1920, the Northeast region's population was in excess of 75 percent urban, while the U.S. population as a whole was only 51.4 percent urban in that same year (Brunner and Kolb, 1933:16). In this same year about two-thirds of the Northeast's rural population was nonfarm, while for the U.S. as a whole, fewer than four out of ten rural residents were nonfarm (Brunner and Kolb, 1933:17).

The most comprehensive data on rural communities in the Northeast during the early twentieth century can be found in Brunner and Kolb's (1933) compilation of impressively detailed information on 140 rural villages across the U.S. for 1920 and 1930. Brunner and Kolb's comparative regional analyses of rural social trends generally underscored the influences of urbanization and industrialization on one hand, and agricultural stagnation on one other, in shaping the character of rural communities in the Northeast. They (1933:88) noted, for example, the fact that in the Northeast a large proportion of rural village and open country residents was employed in nonagricultural pursuits and that "[in] some of the New England states, supplementary work has grown to such an extent that it has become the more important source of income for many farmers who might be better characterized as part-time farmers than as farmers doing part-time work" (Brunner and Kolb, 1933:50).

The data reported by Brunner and Kolb for villages in the Middle Atlantic states (the authors generally did not report data for the New England states) have a dual character. On one hand, incorporated--generally relatively large--places in the Middle Atlantic Region tended to show rates of population growth well in excess of the national average from 1910 to 1930. The trend toward vibrant growth was particularly strong for relatively large Middle Atlantic incorporated places; of the villages in the Northeast with 1,750 or more residents in 1910, 53.3 percent exhibited population growth in excess of 20 percent from 1910-1930, while 42.1 percent did so in the U.S. as a whole (Brunner and Kolb, 1933:75). However, Brunner and Kolb (1933:69) also reported data showing that agricultural neighborhoods in the Middle Atlantic region were disintegrating at a more rapid pace than in the entire U.S., and much of their data on the socioeconomic conditions of agricultural hamlets and small villages in the various regions of the U.S. suggested a pattern of agricultural community decline in the Northeast. Overall, the data indicated that the growing industrialization and spread of urban influence in the Northeast were tending to benefit relatively large, incorporated villages in urban areas of the region, while smaller hamlets and villages in peripheral areas of the region were tending to experience declines related to the lack of dynamism in the agricultural sector (see MacLeisch and Young, 1942, for a corroborating case study of a community in New Hampshire).

The Brunner and Kolb data generally showed that rural villages in the Middle Atlantic region had less advantageous socioeconomic conditions than villages in the Midwest and Far West, with only the Southern region having poorer socioeconomic conditions than the Middle Atlantic area. This observation was the case for per capita retail sales (p. 163), retail stores per village (p. 146), average expenditures for village schools (p. 178), tax revenues per capita (p. 294), and other village characteristics.

Brunner and Kolb's observations about the socioeconomic conditions of rural communities in the Middle Atlantic area were repeated two decades later by Kolb (1952). Kolb (1952:190-1) reported that from 1940 to 1950, nonsuburban villages (with populations of 1,000 - 2,500) in the Middle Atlantic area had, along with the West North Central region, the slowest rate of population growth in the U.S.

The foregoing observations about rural communities in the Northeast before mid-decade can be supplemented by the data collected by Carl C. Taylor and his associates (1949) in the Division of Farm Population and Rural Life of U.S.D.A.'s Bureau of Agricultural Economics. Taylor et al. identified seven major type-of-farming areas in the U.S. (the cotton belt, the corn belt, the wheat areas, the range-livestock areas, dairy areas, Western specialty-crop areas, and the general and self-sufficing areas) and argued that the commodity in which an area was specialized would shape the character of local community life and of town-country relationships. In terms of the seven type-of-farming regions identified by Taylor et al., their observations on the dairy and the general and self-sufficing areas are most germane for our purposes.

The dairy area identified by Taylor et al. (1949) encompassed the bulk of the counties in upstate New York; most of Vermont; portions of Southern New Hampshire, Massachusetts, Connecticut, and New Jersey; and several counties in the Eastern, Western, and Southeastern fringes of Pennsylvania. Arthur F. Raper (1949a), the author of the chapter on the dairy areas, argued that the nature of dairying--the types of inputs purchased and the need to market milk to a local creamery, cheese factory, or other processing plant--tended to make for a close relationship between farm families and their local hamlet or village trade center. Raper noted, however, that there was a different configuration of farm-trade center relations in New England than in the rest of the dairy areas. In New England, social and political activity has long tended to revolve around the town, rather than the county, and accordingly New England dairy farmers were more likely to identify with and trade within small town centers that were non-New England dairy farmers; west of New England, where counties were more important than townships, village trade centers tended to be larger than those in New England and tended to offer a more complete range of commercial services. Raper emphasized as well the fact that the nature of dairying--especially its year-around character and location in agroecological areas unsuited for large-scale grain or livestock farming--tended to lead to relatively small farm operations with little hired labor. Further, because dairy areas tended to have a high level of urbanization and industrialization, these areas had a relatively high prevalence of part-time farming. Raper also detected a trend toward recreational development in dairy areas, especially those in the Northeast. He noted (1949a:432) that recreational development was leading to an "influx of urban people, many of whom are wealthier and better educated than the resident farm families" and that this influx was "affecting local leadership, local organizations and institutions, market outlets for dairy and other farm products, and other aspects of farm and community life."

At the time that Raper wrote about rural communities in the dairy areas, the presence of a creamery or cheese factory in a local village was nearly universal, and he placed great stress on the marketing nexus in the

cohesion of dairy communities. Since that time, of course, one of the major trends in the U.S. dairy industry as a whole has been the shift to Grade A/fluid milk production, with most milk sold to large plants in large villages and cities (Jacobson, 1980). Accordingly, in a more recent period, Richardson and Larson (1976) observed a strong trend among New York farming villages for there to be a decline in agriculturally-related industries (and a rise in nonagricultural industries). Thus, the character of dairy-based farm communities in the Northeast has changed substantially since Raper's (1949a) study--with the decline of the village creamery and cheese factory spearheading the increased orientation of farm families' input and retail purchases and marketing decisions away from smaller villages.

The "general and self-sufficing areas" in the Northeast Region, as defined by Raper (1949b), were primarily located in New York's Southern Tier; in Southern Maine and New Hampshire; in parts of Massachusetts, Connecticut, Rhode Island, and New Jersey; and in the central three-quarters of Pennsylvania. The principal defining characteristics of these areas were their low quality agricultural lands, small farm operations, lack of commodity specialization, low farm incomes, tendency toward part-time farming, and, in some areas, the persistence of small-scale, self-sufficient farming. Raper emphasized that the general and self-sufficing areas had an extraordinarily high degree of interaction between farm households and villages. Given the lack of commodity specialization, many farm products were marketed directly to residents of the village. Also, given the typical rough terrain, social interaction and retail purchases tended to be sharply delineated by village. The life of the village was typically organized around the school and the church. Raper noted that, similar to the dairy areas, farm-village relationships tended to vary between New England and the remainder of the general/self-sufficing areas; in New England, retail purchases and social interactions tended to be focused around the center of town (township) government, while larger county-seat villages and cities tended to be more important outside of New England.

To our knowledge, the only significant quantitative empirical study of the relationships between farm and rural community structure during this period in the Northeast has been that of Swanson (1982). Swanson's study was oriented toward investigating the "Goldschmidt thesis" (see Goldschmidt, 1978; Buttel, 1982a, 1983a) in Pennsylvania. More specifically, Swanson's concern was with whether rates of decline in farming numbers and of the increase in average farm size were associated with declines in farm trade center populations during the 1930-1960 period, which represented hypotheses consistent with the Goldschmidt thesis. Swanson examined 520 agricultural trade centers in 30 Pennsylvania counties over the 30-year period, and his results were generally inconsistent with the Goldschmidt thesis. In particular, there was no association between declining farm numbers and changes in the population of Pennsylvania agricultural trade centers, and there was a positive association between average farm size (measured as total acres harvested per farm) and trade center population over the 30-year period. It should be noted, however, as Swanson did, that average farm size in the 30 Pennsylvania counties increased very little ($\bar{X}$ = 16 acres) over the period, implying that there was little dramatic farm structural change of the sort that Goldschmidt (1978) referred to in his study. The small increases in average farm size in Swanson's Pennsylvania study area, moreover, were from a relatively small base in 1930 (40.5

harvested acres per farm), and family farmers were quite readily able to absorb increased harvested acreages into their farms with modest use of mechanization and with little or no hired labor. Overall, total harvested acres per rural community declined by 21 percent from 1930 to 1960, consistent with the pattern noted above for the Northeast Region as a whole.

Swanson's study suggests two other findings of importance to the relationships between agriculture and community in the Northeast. First, Swanson found that the principal predictor of population change in Pennsylvania agricultural trade centers was change in the proportion of the population employed in manufacturing and tertiary industries, with increases in the former associated with increases in the latter. Average distance to the nearest urban place and to the nearest metropolitan center were generally not associated with population change in farm trade centers, except for a negative relationship between distance to the nearest metropolitan center and trade center population change in the agriculturally-rich, highly-urbanized southeastern region of Pennsylvania. Second, there was evidence that regional economic changes had affected not only trade center population change, but also farm structure. Swanson argued that expansion of trade center populations tended to encroach upon villages' farm land bases, accelerating the rate of loss in land in farms. He also suggested that regional economic change in the form of expanded employment opportunities in manufacturing and services tended to stabilize farm numbers through the availability of the part-time farming option.

More recently, Ali (1973) studied the 13 villages in New York State which were among the 140 villages studied by Brunner and his colleagues (1927, 1933, 1937) in the 1920s and 1930s. Ali focused on changes over the 1920-1970 period, relying primarily on census and **Dun and Bradstreet Reference Book** data. Defining population growth as an increase of 1 percent or more per year, stability as an increase of less than 1 percent per year, and decline as any loss in population over the period, Ali found that five villages had grown, six were stable, and two had declined in population. The five villages with high rates of growth were all located within or adjacent to (1970) SMSA counties, while both declining communities were distant from SMSAs.

Ali (1973) also examined trends in the number of business services in the 13 communities as reported by Dun and Bradstreet. He found that there were very high correlations between population size and the number of business services ($r = .70$ or larger in 1924, 1930, and 1936, and .91 in 1970). In addition, the number of business services was closely associated with proximity to an SMSA county; of the eight communities in or adjacent to an SMSA, seven exhibited increases in the number of business services and one stayed the same over the 50-year period. However, for five villages distant from an SMSA, four experienced declines in the number of business services and one stayed the same.

In the early 1970s Richardson and Larson (1976) restudied the same villages examined by Ali and by Brunner and associates in the 1920s and 1930s. Richardson and Larson noted that while most of the 13 New York villages had been relatively stable over time, there was strong evidence of increased socioeconomic differentiation among these villages. Moreover,

their stability was strongest in noneconomic terms--e.g., in the persistence of neighborhood and social functions--than it was in the economic sphere. Overall, Richardson and Larson detected a pattern of differentiation among the 13 communities based on the ability "to compensate for the major adjustments in the farming part of their communities" (Richardson and Larson, 1976:57). The communities that were able to do so were those located in or proximite to SMSAs in which "vanishing farmers are being replaced, or more than replaced, by nonfarmers" (p. 57). Villages located far from SMSAs had been generally unable to compensate for the decline in farm operators and the farm population. This latter pattern is consistent with Fitchen's (1981) analysis of a declining rural hamlet in a nonmetropolitan region of New York. Finally, Richardson and Larson (1976:57), relying on the data collected by Ali (1973), noted that "[i]ncreasingly, town (township) rate of population growth has been outstripping that of the population center." Richardson and Larson's observation about the relatively vibrant growth of the hinterlands of the 13 New York agricultural villages parallels the findings of Brown and Beale (1981:29-31) about regional patterns of population growth and decline of nonmetro counties in the 1960s and 1970s. Brown and Beale's data show that the nonmetro population "turnaround," which began in the U.S. in the beginning of the 1970s, began far earlier in the Northeast-Great Lakes Region. Over 75 percent of nonmetro counties in the Northeast-Great Lakes area exhibited population growth during the 1960s, compared to 47.5 percent of nonmetro counties in the U.S. Nearly 71 percent of Northeast-Great Lakes nonmetro counties grew in population during both the 1960s and 1970s. Only 44.3 percent of U.S. nonmetro counties experienced population growth during both decades. Eighteen percent of U.S. nonmetro counties exhibited population declines in both decades, compared to only 3.5 percent of Northeast-Great Lakes nonmetro counties.

The data reported by Brown and Beale underscore the high degree of influence of the urban-industrial economy in the Northeast, similar to the configuration revealed by Swanson (1982). Thus, the Northeast, which experienced disproportionately rapid declines in the farm population and in the number of farm operators during the post-War period up to 1970, was the region of the country with the most favorable pattern of nonmetro population growth during the 1960s and 1970s. Clearly, the rapid decline in farm numbers in the Northeast in the 1960s did not, in the main, lead to deterioration of the nonmetro social fabric in the region because of its strongly urban-industrial character. It should be kept in mind, however, that despite the pervasiveness of urban-industrial forces in the Northeast region, there remain a significant number of nonmetro counties that lie outside the orbit of these forces (see Eberts, 1984). The two declining New York village communities studied by Richardson and Larson (1976), the New York hamlet studied by Fitchen (1981), and Shover's (1976) case study of Bedford, Pennsylvania, are examples of this latter pattern.

Further perspective can be gained on the character of the Northeast's nonmetro population at the end of the first seven decades of the twentieth century from the research of Hines et al. (1975). Hines et al. reported data on the socioeconomic characteristics of the population of metro and nonmetro counties for 1970 disaggregated by region. The following are among the observations made by Hines et al. about the characteristics of the Northeast nonmetro population relative to the North Central, South, and West regions.

The Northeast's nonmetro population in 1970 was distinctive in that it had the lowest proportion, 5.2 percent, of residents of the four major regions in extractive industries (agriculture, forestry, fisheries, and mining), while the U.S. nonmetro average was 11.1 percent. Likewise, the Northeast nonmetro counties had the highest proportion of employment in manufacturing (29.2 percent) and the second highest proportion in the service industries (28.4 percent), compared to the U.S. averages of 24.3 and 27.2 percent, respectively. But while the Northeast nonmetro population had a strongly "urban" labor force profile, Hines et al. (1975:36) reported that the Northeast Region as a whole was the only one to have exhibited a decline from 1960 to 1970 in the number of workers in manufacturing (-6.9 percent), while the nonmetro counties in the Northeast had the second lowest rate of increase (6.2 percent) in the number of manufacturing workers among the four major regions. The nonmetro population of the Northeast, however, showed substantial growth in employment in the service sector (32.8 percent) from 1960 to 1970, which was slightly above the average for the U.S. nonmetro counties as a whole (28.6 percent). Thus, while the Northeast's nonmetro counties did experience the growth in rural industrialization that became prevalent throughout the U.S. in the 1960s and 1970s (Campbell, 1975; Summers et al., 1976), the region's nonmetro counties were already highly industrial in 1960 and exhibited little increase in manufacturing employment during the decade. The Northeast's growing nonmetro population tended more strongly to take service sector jobs from 1960-1970.

Data reported by Hines et al. (1975:41) on median 1970 earnings for residents of nonmetropolitan counties showed that the Northeast was well above the U.S. nonmetro average ($6,970 and $6,236 for males, and $3,363 and $3,052 for females, respectively). Earnings of Northeast nonmetro males were the second highest of the four regions, while Northeast nonmetro females' earnings were the highest in the country. These high nonfarm wage rates encouraged farmers in the Region to leave agriculture in the post-World War II period (Schertz, 1979:274). But while earnings of Northeast nonmetro residents were above the national average in 1970, the nonmetro Northeast's median family income grew somewhat more slowly (68.3 percent) from 1959-1969 than it did in U.S. nonmetro counties as a whole (69.4 percent; Hines et al., 1975:46).

The pattern that emerged from the Hines et al. data was of a Northeast nonmetro population that was relatively privileged in 1970, but that was tending to decline in its socioeconomic advantages relative to the U.S. nonmetro population as a whole. The relatively slow pace of nonmetro industrial growth in the region, which paralleled the decline of Northeast industry that began in the 1960s (Young, 1984), apparently contributed substantially to this phenomenon. The Northeast nonmetro counties also experienced a decline in employment in the extractive industries (-36.0 percent) during the 1960-1970 decade that was above the national nonmetro average (-34.0 percent) (Hines et al., 1975:36). The decline of the Northeast's extractive industries' employment probably contributed to some degree to the worsening of the Region's relative socioeconomic status among the nation's nonmetro counties, especially in the Region's highly rural areas such as Northern New England and the North Country of New York State.

APPENDIX B. CORRELATION MATRIXES

TABLE B1. SIMPLE CORRELATIONS AMONG FARM SECTOR, POPULATION, AND NONFARM CONTEXTUAL VARIABLES[1]

All Nonmetropolitan Counties (N=105)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. CORPORATE	-										
2. FULLOWN	.36*	-									
3. PART-TIME	-.10	-.08	-								
4. WORKFARM	.29*	.18	-.10	-							
5. CHEMICALS	-.25*	-.30*	.13	-.43*	-						
6. MACHINERY	.17	-.15	-.23*	.27*	-.06	-					
7. SALES	-.18	-.03	-.09	.62*	-.25*	.33*	-				
8. NFEMPLOY	.03	.22*	-.10	.16	-.02	-.09	.24*	-			
9. URBAN	.21*	.26*	.00	.14	-.09	.05	-.02	.17	-		
10. WORKERS	.07	-.12	-.11	.69*	-.23*	.37*	.59*	.02	.00	-	
11. FARMPOP	-.02	.12	-.06	.04	.11	-.27*	.07	.18	-.09	-.20*	-
12. RURALPOP	-.09	-.04	-.15	-.08	-.11	-.03	-.06	-.04	.07	-.11	-.07

Agricultural Counties (N=30)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. CORPORATE	-										
2. FULLOWN	-.01	-									
3. PART-TIME	.26	.03	-								
4. WORKFARM	-.10	.24	.00	-							
5. CHEMICALS	.07	-.04	.26	-.62*	-						
6. MACHINERY	.28	-.11	-.09	.01	.15	-					
7. SALES	-.23	.23	-.02	.84*	-.62*	-.08	-				
8. NFEMPLOY	-.34	-.04	-.16	.18	-.19	-.40*	.29	-			
9. URBAN	.34	.08	.06	.01	-.01	.03	-.09	.18	-		
10. WORKERS	-.09	.15	.03	.81*	-.58*	.05	.76*	.18	.12	-	
11. FARMPOP	-.24	.19	-.16	.22	-.07	-.09	.34	.23	-.53*	.14	-
12. RURALPOP	.26	.23	.24	.06	-.12	-.40*	.12	.27	.37*	.13	-.06

[1] Correlation coefficients are Pearson-r statistics. Those significant at a .05 level of probability are labelled "*." All variables except NFEMPLOY, URBAN, and SALES were computed as simple gain scores measuring differences over a ten-year period. NFEMPLOY measures the percentage of a county labor force employed in manufacturing and services in 1970. URBAN measures the urban percentage of a county population in 1970. SALES measures the percentage change in gross farm sales between 1969 and 1978.

TABLE B2. SIMPLE CORRELATIONS AMONG VARIABLES IN THE MODELS FOR COMMUNITY WELL-BEING[1]

All Nonmetropolitan Counties (N=105)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. POVERTY	-												
2. INCOME	-.39*	-											
3. RETAIL	-.06	.22*	-										
4. HOUSING	-.12	.07	.00	-									
5. TAXES	.30*	-.02	.14	-.29*	-								
6. RURALPOP%	.02	.01	-.03	.07	-.20*	-							
7. FARMPOP%	.07	.31*	.50*	.14	.02	-.01	-						
8. CORPORATE	.08	.05	-.11	-.12	-.02	-.04	.06	-					
9. FULLOWN	-.19*	.25*	.02	.13	-.20*	.01	.24*	.36*	-				
10. PART-TIME	-.15	.20*	.25*	.09	.10	-.14	.09	-.10	-.08	-			
11. WORKFARM	-.05	.07	-.11	.07	-.19*	.00	.02	.29*	.18	-.10	-		
12. SALES	-.09	.08	-.11	.17	-.34*	.11	.03	-.18	-.03	-.09	.62*	-	
13. NFEMPLOY	.01	.11	-.09	.33*	-.46*	.26*	.18	.03	.22*	-.10	.16	.24*	-
14. URBAN	.14	.26*	.24*	.27*	-.01	.23*	.48*	.21*	.26*	.00	.14	-.02	.17

Agricultural Counties (N=30)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. POVERTY	-												
2. INCOME	-.52*	-											
3. RETAIL	-.03	.29	-										
4. HOUSING	-.36*	.24	.08	-									
5. TAXES	.10	-.24	-.17	-.46*	-								
6. RURALPOP%	.15	-.01	.04	.39*	-.14	-							
7. FARMPOP%	.07	.42*	.59*	.32	-.33	.12	-						
8. CORPORATE	.28	-.19	.35	-.30	.31	-.02	.18	-					
9. FULLOWN	-.06	.41*	-.06	.12	-.06	.17	.38*	-.01	-				
10. PART-TIME	.27	.05	.47*	-.18	.07	.06	.23	.26	.03	-			
11. WORKFARM	-.38*	.38*	.23	.12	.00	.01	.30	-.10	.24	.00	-		
12. SALES	-.33	.51*	.27	.11	-.31	-.03	.37*	-.23	.23	-.02	.84*	-	
13. NFEMPLOY	.08	.18	-.03	.45*	-.58*	.39*	.31	-.34	-.04	-.16	.18	.29	-
14. URBAN	.22	-.06	.30	.45*	-.04	.49*	.46*	.34	.08	.06	.01	-.09	.18

[1] Correlation coefficients are Pearson-r statistics. Those significant at a .05 level of probability are labelled "*." All variables except NFEMPLOY, URBAN, and SALES were computed as simple gain scores measuring differences over a ten-year period. NFEMPLOY measures the percentage of a county labor force employed in manufacturing and services in 1970. URBAN measures the urban percentage of a county population in 1970. SALES measures the percentage change in gross farm sales between 1969 and 1978.

FOOTNOTES

1. The choice of 1969/70 to 1978/80 as the time frame for the empirical analysis has one major advantage but also a key disadvantage. The advantage is that this is the most recent decade-long period for which data are available, giving us greater confidence that the empirical patterns that are discovered and generalizeable to the current structure of the Northeast's agricultural and rural economies. But it should also be recognized, as noted above, that the decade of the 1970s was not one of rapid technological change in Northeast agriculture. Thus, our results will be limited to some degree in the inferences that might be drawn regarding the socioeconomic impacts of rapid technological change in Northeast agriculture over the next 15 to 20 years.

2. As noted earlier, legally incorporated farms in the Northeast in 1982 averaged approximately 400 acres per farm, about 2.3 times larger than the average for all census farms in the Region. The percentage of incorporated farms is, to be sure, a less-than-ideal measure of the degree to which agricultural production is concentrated in large farm units, but we feel that this measure is preferable to others available in both the 1969 and 1978 Censuses of Agriculture. Gross farm sales in particular, is a frequently employed indicator of farm scale. There are, however, several major problems in utilizing gross farm sales categories from the 1969 and 1978 censuses as the basis for an indicator of the changing scale of agricultural production. First, due to inflation, gross farm sales categories are not comparable over time. Second, the upper bound for gross farm sales in the 1969 Census of Agriculture was $40,000 or more, which could be said to represent a category of somewhat larger than average commercial-size farms. An indicator based on farm acreage would also be inappropriate for the Northeast Region because of its highly variable soil resources. Thus we have chosen the percentage of incorporated farms as an indicator of the scale of agricultural production in preference to alternative indicators based on gross farm sales and acreage categories.

3. The discussion here summarizes that in OTA (1984a).

4. The discussion here is drawn from Boynton et al. (1984).

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